THE ROCKWELL

GAS REPORT

DEVOTED TO THE INTERESTS OF THE GAS INDUSTRY

VOL. 2 JULY 1957 NO. 2

BRAINSTORMING . . .

. . . digging for ideas to help you

The photo above shows a group of Rockwell engineers at a recent "Brainstorm Session." These sessions are designed to produce an interchange of ideas with particular emphasis on purely creative thinking about how to solve pre-stated problems. In a meeting such as this, comments like—"We tried that before and it didn't work" and "Good, but the boss won't like it"—are ruled out. Even wild ideas are encouraged because experience proves that it is far easier to tame down a wild idea than it is to pep-up a dull one. Also, wild ideas often stimulate other members of the group to think about a more practical approach.

"Brainstorming" is just another example of the *creative engineering* that is an unseen part of every Rockwell product for measurement and flow control. As an example, a number of years back it was thought impossible to use aluminum for gas meters. But, by use of new aluminum alloys and specially developed die-casting techniques, Rockwell pioneered the durable, highly corrosion-resistant aluminum gas meter housing.

The topic being discussed by the men in the photo above is, "Subjects for the ROCKWELL GAS REPORT." The articles that you read in this section and the ones to follow originated at this meeting. However, if you should have any special problems or unique ideas that you would like us to "Brainstorm" or report, please don't hesitate to write: Rockwell Manufacturing Company, Pittsburgh 8, Pa.

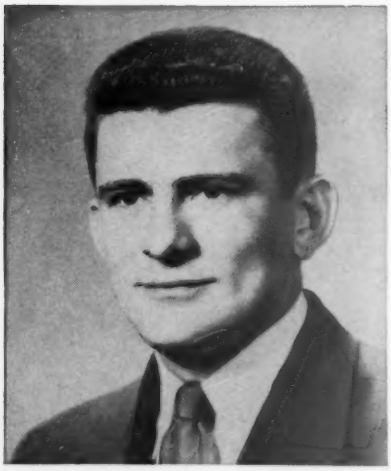
ROCKWELL Meters and Regulators

ROCKWELL-Nordstrom Valves

THE GAS METER OF THE FUTURE

May Be Made of Plastic

by L. A. McGowan, Chief Engineer,
Meter & Valve Division, DuBois Plant, Rockwell Manufacturing Co.



It has been said many times and in many ways that gas meters have not changed for fifty years. This statement rings true with respect to basic principles of operation and it is partially so from the standpoint of certain engineering design principles. Meters *have changed*, though, in material design and in material application. For this reason, it is entirely conceivable that gas meters in the next fifty years will be constructed almost entirely of plastic materials.

Today's gas meters are far more accurate and far more durable than the gas meter of fifty years ago. Technical improvements in materials available to the engineer for use in the manufacture and design of gas meters have been the major reasons for increased accuracy and improved durability. For example, the use of aluminum has materially decreased meter weight and improved the appearance . . . and, in a majority of applications, aluminum has also improved the corrosion resistance. The use of lubricated powdered metal bushings and bearings is another contribution towards the elimination of wear as a problem. It does not seem too unreasonable, then, to suggest that future use of plastic materials may further decrease the weight, improve appearance, decrease wear, and eliminate noise in gas meters.

Plastic Already in Use

Plastic materials are already used to a limited extent in gas meter construction. For example, valve covers made of a phenolic material have been in use for approximately twenty years. Plastic insulated connections of various designs and materials are also being used at present. Through limited applications such as these, considerable engineering data and practical experience have been gained.

In the very early phases of plastics, much harm was done by misapplication of materials. Cheap toys, easily damaged kitchenware and a host of other plastic products of inferior quality and design teamed-up to give plastics a bad name.

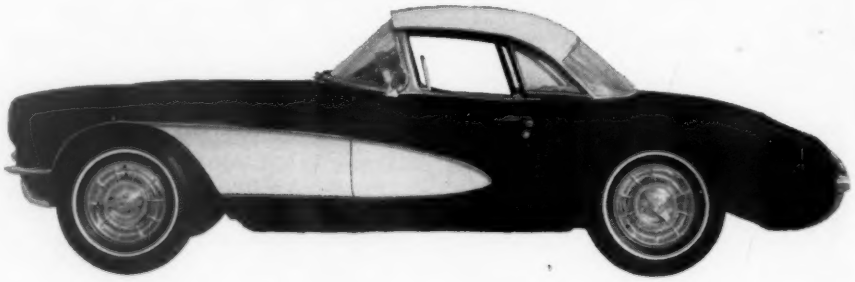
Today, plastic materials are available in an infinite variety of types and kinds. These materials have a full range of physical, chemical and mechanical properties. Plastics engineering and technology have now progressed to the point where structurally sound, functional and reliable industrial parts made of plastic are a firm reality. In fact, it is now considered that many plastic materials are truly *engineering materials*. This means that sufficient engineering tests and data have been accumulated so that the engineer or technician can logically predict the chemical and mechanical properties of many plastics. Like with most metals, then, he can logically recommend the proper material for a specific job.

Versatility of Plastics

Plastic is a very general term covering an infinite number and variety of synthetic materials and combination of materials. In considering plastic materials for use in gas meters, it is necessary to evaluate the requirements and performance of each individual part under consideration. For example, a proper material for gas meter housings should have high impact strength, dimensional stability, electrical insulation and corrosion resistance.

In order to fulfill all of the many requirements of a plastic material for use in a gas meter housing, the first requirement is a detailed consideration of each of the major classifications of plastic materials which might possibly do the job. Samples have to be made and extensive laboratory tests conducted before determining which of the many materials are best suited for further field testing. In a strict engineering analysis of plastic materials, a primary need is sufficiently high impact strength and mechanical properties to prevent damage in any normal handling. Also, the material must be a non-conductor of electricity; must be highly corrosion resistant; must be dimensionally stable from −50° F to 400° F. When all these requirements are met, as well as many others, it is possible that a plastic gas meter housing will be available which will not require insulation; which will have superior resistance to corrosion and which will substantially decrease maintenance costs by eliminating the need for painting.

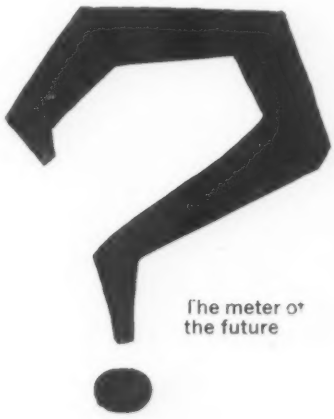
In certain engineering samples and experimental work already under way, meter housings have been designed to accommodate the internal mechanism of a meter which has been accepted, tried and proven in aluminum die cast meters. These samples will enable field trials and tests of plastic housings without posing a problem as to the effect of the plastic material on the proof or performance of the meter.



A dramatic example of the beauty and durability of modern plastics is the Chevrolet Corvette with its plastic reinforced fibreglass body.

Early cast iron meter

Modern Rockwell aluminum meter



The meter of the future

In conjunction with the work on plastic housings for gas meters, consideration has been taken of the potential for plastics in *all* of the other parts of the meter. With materials readily available today, practically all parts of the internal mechanism of a gas meter represent a possibility for some type of plastic. In the vast majority of these potential applications, an improvement in quality of the meter would be a definite possibility. Because of the extreme importance of not in any way affecting the performance or proof of a gas meter without long and extensive tests, considerable additional work is now being done on these parts. Much interesting information has already been gained. It is known, for example, that some of the materials under test will someday offer definite improvements to the metering of natural gas.

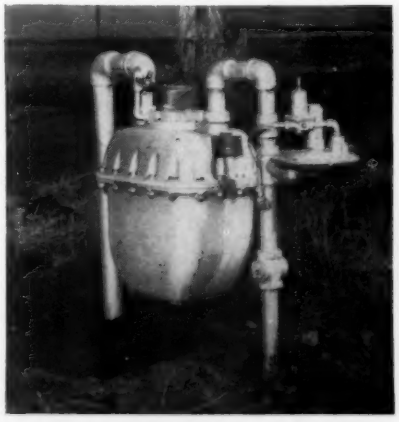
Search for Improvement

There are other engineering reasons for the consideration of plastic as a gas meter material. Plastic suppliers are now in a position to replace materials that are or could become critical from a supply standpoint. And, as the supply and use of plastic materials increase, they may someday soon have a cost advantage over metals.

Engineering-wise, we are most interested in improving the performance of gas meters. It may be possible that someday a plastic meter could be designed which would utilize all of the qualities and advantages of plastic materials. We believe that after the necessary tests, experiments and field trials have been completed, plastic materials will aid us in accomplishing this purpose in the manufacture of gas meters.

The fact that plastic materials have truly become engineering materials points up a prophesy that a plastic gas meter may well be the gas meter of the future.

Natural Gas Engines for Irrigation



Natural gas has proved an ideal fuel for powering irrigation pumps in Southwestern cotton and rice fields. Both of these crops require large quantities of water—especially rice—and hence extensive pumping facilities. Other fuels are usually not economical in view of the extensive power demands.

Natural gas is provided through direct taps from main transmission lines or from higher pressure distribution lines. A typical measurement and regulation set-up is illustrated above with the No. 800 Rockwell large capacity meter and No. 173 pressure regulator.

An Economical, Efficient

FLOW CONTROL STATION

by H. J. Evans, Chief Engineer,
Central Gas Engineering, Rockwell Manufacturing Co.

The Flow Control Station with a downstream capacitance (underground storage, holder, large pipeline capacity, etc.) maintains a maximum demand flow rate, which prevents distribution peak loads from affecting transmission line loads. This permits a constant transmission line flow rate for high transmission efficiency and economy.

Application and Operation

The Flow Control Station is used where storage is available and a set demand flow from the transmission line is desired.

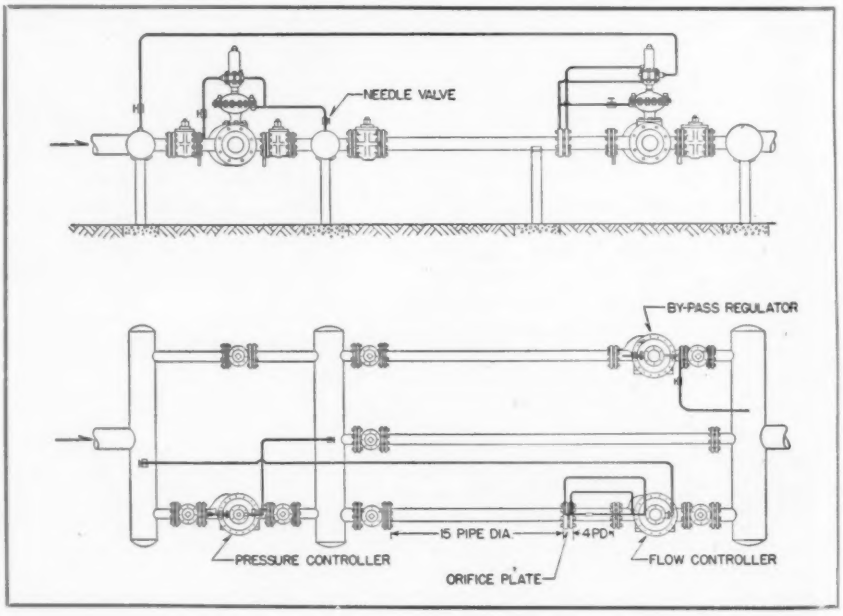
The Flow Controller maintains a maximum demand flow from the transmission line by controlling the pressure differential across the orifice plate. The differential is usually about 4 to 7 psi. and the orifice plate must be sized for the flow required to give this differential. The By-Pass Regulator is set for the minimum downstream pressure and the Pressure Controller for the maximum downstream pressure. If the demand downstream exceeds the Station flow rate, the storage will yield its supply until the downstream minimum line pressure is reached, at which time the By-Pass Regulator will open, providing emergency flow. If the downstream demand is less than the Station flow rate, storage will be filled until the maximum downstream pressure is reached, at which time the Pressure Controller will close (the Flow Controller will open wide) to maintain the maximum downstream line pressure. Constant flow across the orifice plate will be maintained at all times except when the downstream pressure reaches the maximum setting. Proper sizing of the Station with relation to normal demand and storage available will permit maximum demand flow to be maintained, except for unusual load periods.

How the Station is Operated

This should be accomplished when downstream flow is less than the desired Station maximum demand flow.

1. Make sure all valves including needle valves are closed.
2. Slowly open By-Pass Regulator outlet valve and control line needle valve.
3. Open By-Pass Regulator inlet valve.
4. Slowly open Pressure Controller "by-pass valve," and adjust By-Pass Regulator for Station Minimum Pressure setting.
5. Slowly open Pressure Controller outlet valve and control line needle valve.
6. Slowly open Pressure Controller inlet valve and Pilot supply line needle valve; throttle flow of Pressure Controller "by-pass valve" and adjust Pressure Controller for the Station maximum pressure setting; close by-pass valve.
7. Slowly open Flow Controller outlet valve and control line needle valve.
8. Slowly open Flow Controller pilot supply line needle valve and Flow Controller inlet valve.
9. Adjust Flow Controller for demand flow and replace adjusting cap. Observe operation until maximum downstream pressure is reached, at which time the flow chart should indicate a reduced flow. To recheck, close Flow Controller Pilot Supply needle valve until downstream pressure reaches the minimum setting; slowly open Flow Controller Pilot Supply and permit downstream pressure to return to maximum setting pressure. The chart curve will show a small change in differential for the two extremes of downstream pressure.
10. Adjust needle valve on Flow-Controller control line to dampen regulator if required.

Regulators having needle valves installed in the control piping which does not originate at the regulator, should be removed from service by closing the pilot supply line needle valve first and then the control line needle valve, before the block valves are closed. This will prevent any possibility of damage to the regulator diaphragms from overpressure.



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Corrosion in Domestic Water Heaters

Robert C. Weast, *Acting Head*
Department of Chemistry and Chemical Engineering, Case Institute of Technology, Cleveland, Ohio

CORROSION of gas-fired water heaters is a problem that will probably always be with us to a certain degree until somebody accomplishes one of the following:

1. Treat water in a manner which will render it non-corrosive without destroying its potability;
2. Formulate an alloy which is relatively inexpensive and which is not corroded by hot water;
3. Provide a water impervious coating on steel that is perfectly continuous, said coating itself not being dissolved or corroded to any appreciable extent by the water;
4. Provide a coating through which water may pass but due to its passage through the coating the water becomes non-corrosive; or
5. Make the tank metal so highly electronegative with respect to its environment that the metal ions will be incapable of leaving the crystal lattice.

The problem of corrosion of gas-fired water heaters can be reduced if the findings of American Gas Association research are applied from an engineering standpoint. All of the research sponsored by the American Gas Association at Case Institute of Technology has been directed toward measuring the magnitude of influence by certain factors on the corrosion rate of gas-fired water heaters.

Over the years a number of variables have been investigated. Among these are:

1. Effect of galvanic coupling, i.e., the effect of joining a water heater made from one type of metal to a pipe made from another type of metal;
2. Effect of different gas input rates on corrosion rate of 30-gallon heaters when the input rate ranged from 10,000 to 37,000 Btu per hour;
3. Effect of having different quantities of water passing through 30-gallon tanks where the volume of water ranged from 75 to 250 gal per day; and
4. Comparison of effects of Cleveland tap water to those of zeolite softened Cleveland tap water.

Each of these has been reported in AGA publications. More recent work has been concerned with determining:

1. The influence of tank capacity on the corrosion rate of the tanks;
2. The influence of copper dip tubes as compared to plastic dip tubes on corrosion of the tanks;
3. The effect of tank style when three types of tanks were considered, i.e., center flue, offset flue, and floater tanks;
4. The effect of zinc thickness of galvanized steel tanks on the corrosion rate of the tanks;
5. The effect of the water storage temperature on the corrosion rate of the tanks; and
6. Further work on the comparison of Cleveland tap water and zeolite softened Cleveland tap water as they influence corrosion of hot water tanks.

Since steel or galvanized steel corrode in domestic hot waters with consumption of some or all of the dissolved oxygen in the water, it is possible to follow the rate of corrosion by analyzing for the quantity of dissolved oxygen that disappears while the water is in the tanks. This chemical analysis was the one employed during the investigation of the last named six factors. Thus the data presented in this report are based upon this chemical analysis.

Let us consider the factors in the order in which they have just been presented.

1. Influence of tank capacity on the corrosion rate of the tanks. The answer to the problem of whether the home owner should purchase a 20, 30, 40, 50-gal or even larger size water heater is usually dictated by practically any factor except — how long will the tank last?

Theoretical considerations would indicate that if the same volume of hot water were passed through a small tank as through a large tank there should be more corrosion in the small tank. Since the smaller tank would have a smaller surface area than the larger tank, it would necessarily follow that there would be a greater concentration of corrosive material passing over a unit area of the smaller tank per day. That this theory is sound was borne out by data obtained from tests conducted for 21 months on tanks of 20, 30, 40 and 50-gal capacity. When 10 gallons of water were withdrawn eight times per day from each tank, it was found that the corrosion intensity, as measured by the dissolved oxygen analyses, was 1.2 times greater in the 20-gal tanks than in the 30-gal tanks, was 1.5 times greater in the 20-gal tanks than in the 40-gal tanks and was 1.8 times greater in the 20-gal tanks than in the 50-gal tanks.

Thus it is clearly evident that a 50-gal heater should last nearly twice as long as a 20-gal heater under the conditions of the test.

2. Influence of copper dip tubes on corrosion of water heaters. Copper is a metal highly corrosion resistant to water conditions encountered in domestic water heaters. It possesses several advantages when used as a dip tube material.

Unfortunately, its electronegativity is such that it accelerates the corrosion of most any other metal to which it is directly connected.

The metals used for the construction of water heater tanks are no exception — they, too, are corroded when connected to copper dip tubes. The corrosion is brought about by the small electric current which flows from the tank wall to the dip tube. The magnitude of the current will depend upon the temperature of the water and the total dissolved solids in the water.

Results of tests made during this investigation showed that about 4.5 ma

of current flowed when the temperature of Cleveland tap water, either raw or softened, was 160 F. This is equivalent to about one ounce of zinc or 1.2 ounces of iron being removed from the tank per year.

This is not a great quantity of metal, if such a loss were evenly distributed over the entire surface of the tank. Usually this is not the case; most metals corrode in a pitting manner so that the corrosion is accelerated at a few points. If one were to design a support so that the copper or brass dip tube were not directly connected to the tank the galvanic corrosion resulting from the direct connection of the dip tube to the tank would be eliminated.

A comparison of the quantity of dissolved oxygen consumed per square foot of tank area in tanks that had copper dip tubes to that in tanks that had plastic dip tubes indicated that in all cases the corrosion intensity was greater in tanks having the copper dip tubes.

On the average, the corrosion intensity was about 10 percent greater in tanks with copper dip tubes. This corrosion intensity is in excess of that anticipated from the measured quantity of current that flowed from the tank wall to the dip tube. There is a possibility that in addition to the corrosion caused by the current there was additional corrosion caused by deposition of copper ions on the tank wall. These copper ions could have been present in the water as a result of very slight corrosion of the interior of the dip tube.

It is improbable that any of the exterior of the copper dip tube corroded to furnish copper ions to the solution, since the exterior of the dip tube was being provided with cathodic protection by the tank wall. Deposition of these copper ions on the tank wall would have resulted in local cell corrosion on the tank wall and would have accelerated the corrosion of the tanks.

3. Influence of tank style on the corrosion rate of water heaters. There are, in general, three types of water heater tanks. They are:

center flue tanks,
offset flue tanks, and
floater tanks.

In most instances floater tanks are of larger diameter and shorter height than are center flue and offset flue tanks of equal capacity. On the basis of our previous argument that when equal volumes of water are withdrawn from two different tanks having different surface areas, the tank with the smaller surface area will suffer the greater corrosion; one might expect that the floater tank will corrode more than will the center flue tank.

Tests performed with three styles of tanks show conclusively that center flue tanks corrode at a faster rate than do either floater tanks or offset flue tanks. Cause of relative lower corrosion rates in tanks of these latter two styles is probably associated with lower turbulence in these tanks while water was being heated.

Lower turbulence would cause less dissolved oxygen to come in contact with the tank walls and would consequently not accelerate corrosion. The quantity of dissolved oxygen which comes in contact with the tank wall per unit time is quite significant in the corrosion of either zinc or iron.

4. Effect of zinc thickness of galvanized steel tanks on corrosion rate of the tanks. Twelve tanks were used to evaluate this variable. Except for one pair of tanks, there was no significant difference in the quantity of dissolved oxygen consumed for pairs of tanks operated under corresponding conditions. However, the final appearance of the tanks having three ounces of zinc per square foot of tank area was superior to the appearance of the tanks having only two ounces of zinc per square foot. The reason for this may result from the fact that, when iron corrodes to form ferrous ions, the same amount of dissolved oxygen is consumed as when zinc corrodes to form zinc ions.

Since zinc corrosion products are white while those of iron are colored, it is possible for the tank with the heavier zinc coating to be corroding as rapidly as the one with the thinner coating and still appear to be in better condition at the end of 21 months.

5. Effect of water storage temperature on corrosion rate of water heaters. The corrosion rate of practically all metals increases with increasing temperature of the water. The rate of increase is not the same for all metals, because corrosion is influenced by other factors than temperature and the influence of such factors is difficult to isolate from the temperature effect. Nevertheless, it is believed that elevated temperatures influenced more the corrosion of the heaters in this series of tests than did any other factor.

Tests conducted on 30-gal center flue heaters with unsoftened Cleveland tap water showed that the corrosion intensity at 150 F was 1.57 times greater than at 140 F, that the corrosion intensity at 160 F was 1.85 times greater than at 140 F and that the corrosion intensity at 180 F was 2.42 times greater that at 140 F.

Similar tests conducted on the same type heaters with zeolite softened Cleveland tap water yielded the following data:

Temperature	Relative Corrosion Rate
140 F	1.00
150 F	1.65
160 F	2.14
180 F	2.71

Although the above data indicate that the increase in temperature causes a reasonably close corresponding relative increase in corrosion rate irrespective of whether the water is hard or soft, one is cautioned that the corrosion rates are only relative within one type of water and that it is not possible to compare directly the relative rates with hard water to the relative rates with soft water. This is due to the fact that the quantity of corrosion in soft water was always greater than the quantity in hard water as will be shown in the following paragraph.

6. Comparison of Cleveland tap water and zeolite softened Cleveland water as they influence corrosion of hot water tanks. That water composition is an important factor in corrosion rates of metals is well known. It is generally conceded that waters, which do not form carbonaceous scales and which are high in dissolved oxygen and carbon dioxide, are more corrosive than those which do form scales and are low in the aforementioned dissolved gases. Tests made on eight 30-gal center flue water heaters at 140, 150, 160 and 180 F with softened and unsoftened water (Cleveland tap water) produced the following data on the corrosion rate ratio of softened water to unsoftened water:

Temperature, F	Rate in Softened Water / Rate in Unsoftened Water
140	1.22
150	1.29
160	1.39
180	1.36

Data in the above table indicate that the corrosion rate of the water heaters was from 22 to 39 percent greater in the softened water than in the unsoftened water. In no case was the corrosion rate of the water heater retarded by the softening of the water.

In conclusion, it might be stated that if a person were purchasing a contemporary water heater solely from the standpoint of obtaining a long service life from the heater, he should purchase one which produces a minimum of turbulence during the heating cycle and during draw-off, one which as a large capacity, has a non-metallic dip tube (if it has a dip tube) and adjust the thermostat so that the maximum water temperature in the tank is 150 F.

Acknowledgment

This article developed from a talk presented at the 1957 AGA Domestic Gas Research and Utilization Conference, Cleveland, Ohio. ★ ★ ★

Robert D. Hays
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Gas Load Control Through Telemetering

TELEMETERING is a far cry from the native drums in the jungles of Africa or the pony express of the Old West — but all do the same type of work: *Convey information.*

Before Illinois Power Company installed telemeters, load information was obtained by personal contact over telephone or by telegraph, with much time spent in working out the meaning of the figures. Historical information is good to have, but effective gas load control requires modern methods of assembling information quickly and accurately.

Telemetering does this job. And it does it well for Illinois Power Company.

Why Telemetering?

Illinois Power Company purchases gas from four pipeline suppliers for about 175,000 customers, including 83,000 spaceheating customers, located in 60 communities in central Illinois. Community size varies from 300 to cities like East St. Louis and Decatur, with about 85,000 people each.

Gas is purchased from Mississippi River Fuel Corporation (to serve East St. Louis, Belleville, and Granite City); Panhandle Eastern Pipe Line Company (serving 75,000 customers in the Jacksonville, Decatur, Champaign, Danville, and Galesburg areas); Natural Gas Pipeline Company of America (LaSalle and Kewanee); and Texas Illinois Natural Gas Pipeline Company (Mt. Vernon, Centralia, and Monticello). A fifth supplier, Michigan Wisconsin Pipeline Company, will be added in 1957 to serve Cambridge, near Kewanee.

With this diversity of supply and location, along with variables introduced by the weather, it becomes somewhat of a task to exercise a measure of close control over the gas load.

The four pipeline companies deliver gas to Illinois Power Company through 21 town border stations. In these stations there are 33 orifice meter runs and three positive displacement meters.

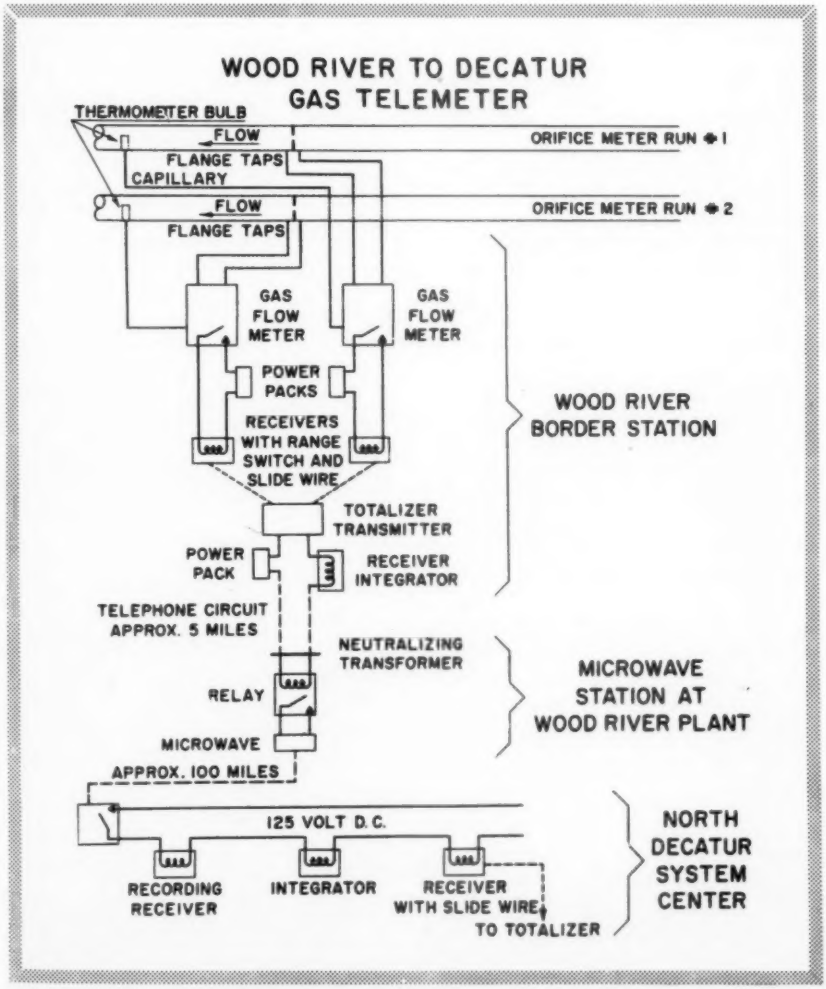


FIG. 1. Diagram of typical border station installation.

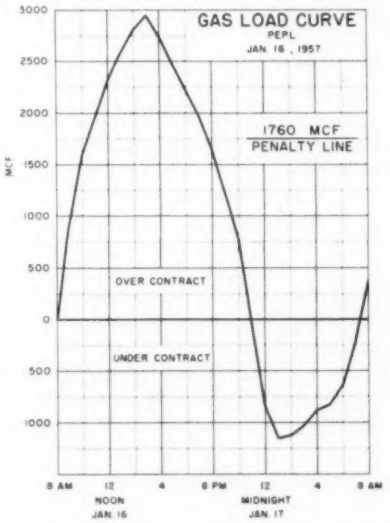


FIG. 2. Gas load curve plotted from actual flow data.

Telemeter equipment has been connected to 29 of the orifice meters in 17 of these stations. Telemeters will be connected in the other stations when load growth justifies the installations.

Telemetering Began in 1950

Illinois Power began its experience with gas telemetering in 1950 when equipment was installed in the LaSalle station of Natural Gas Pipeline Company.

It was found that the local gas man

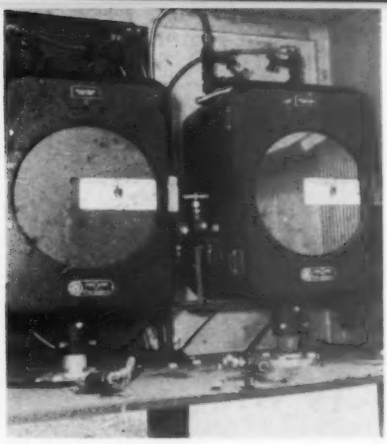


FIG. 3. Ring balance flow meter.

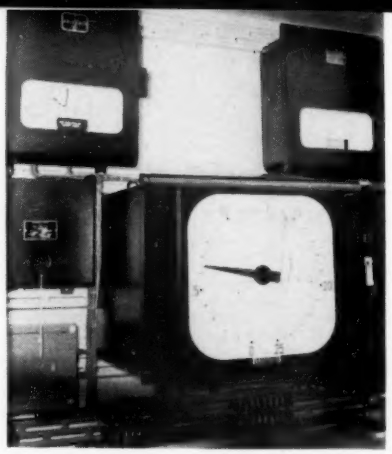


FIG. 4. Slide wire and other instruments.

was spending most of his time in the winter, driving miles several times every day from his office to the border station, reading the orifice meter chart and integrating the readings. If the weather was really cold, he would also check the load at night, trying to find out whether or not he was about to exceed the contract. On some occasions he didn't even go home but spent the whole 24 hours at this task.

It seemed, therefore, desirable to install a flow telemeter to make the job less burdensome and to get data faster and more accurately. Accordingly, a transmitter was installed in the border station and a receiver in the local office. This receiver was equipped with a chart for a graphic record and an index so that by reading the index periodically the volume of gas delivered could be determined.

About a year later a similar unit was installed at Kewanee. In this case the border station is 11 miles from town, and as the gas load increased the need for telemetering was apparent.

Also about this time the pipeline companies put penalty clauses in their tariffs so that there was a real need to stay within the limits of the pipeline contracts. Therefore a study of the situation was initiated with the idea that eventually, gas flow telemetering would become general.

Illinois Power was fortunate in that its electric department had been using telemeters for several years. D. F. Hazen, technical consultant to the chief electrical engineer, worked with the company's gas engineers to study the requirements of the gas department; and he greatly assisted in the design, installation, operation and maintenance of the gas telemetering equipment.

Through this study it was decided to use the ring balance type of flow meter and pulse type telemeter equipment, correcting the metered volume for pressure and temperature, and to transmit the data to a distant receiver.

Border Station Installations

Fig. 1 is a diagram of a typical border station installation with connection to a microwave station and distant receivers in the Decatur system center. The flow meters are connected to flange taps across the orifice plate and are placed at 180 deg to the pipeline company's taps. A thermometer bulb is installed in each meter run downstream from the orifice plate and is connected to the flow meter by capillary tubing. The differential across the orifice plate and the static pressure are fed into the flow meter and this energy, along with the temperature sensing element is transformed into volume flow data.

This data is transmitted to a slide wire receiver. The slide wire with its calibrating resistors, one set for each orifice size, corrects for average heating value and the numerous other constants injected into the billing formula by the respective pipeline companies. At locations with a single meter run, the flow meter transmits on a 0-100 scale; this must be multiplied by a constant in Decatur to find the Mcf flow.

In a border station with two or more meter runs, using Wood River as an example, each slide wire receiver sends its data to a totalizer which adds the flows through all of the meters in the border station into one figure, thus integrating the data. This information is then transmitted by means of a telephone circuit to the Wood River Power Station where it is relayed over a microwave system to Decatur headquarters.

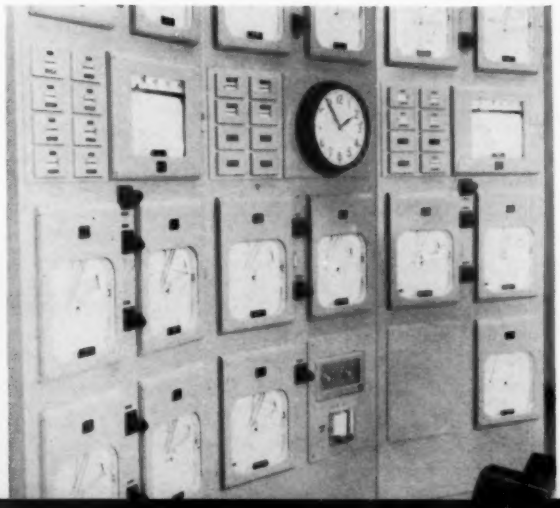
In North Decatur the flow data is recorded on a receiver and integrated on a counting device as corrected volume in thousands of cubic feet The data is again transmitted to another totalizer where all of the telemetered flows from the pipeline are recorded as rate of flow. Another counting device is connected with the totalizer so that the entire telemetered volume delivered from the pipeline is integrated into one figure.

To make the equipment fully effective, the receivers must be attended 24 hours a day, seven days a week throughout the winter season. The integrating cyclometers are read every hour and load curves are plotted for each pipeline supplier as the data are received in the system center in Decatur.

Extrapolations are made at intervals to obtain an idea of how much gas will be required for the entire day. If the load forecast indicates that action is required to avoid overrun penalties, orders are sent out by telephone to reduce the flow so as to keep the 24 hour total purchase within the pipeline contract.

FIG. 5. Border station at LaSalle. Telemeter equipment is housed in cabinets to left of meter and regulator building.

FIG. 6. Panel board in Decatur system center.



In Fig. 2 actual flow data have been plotted for a day approaching maximum conditions. The pipeline day begins at 8 a.m., with zero volume, and, as the day progresses, the integrator is read each hour. The data indicate an increasing rate of flow until 3 p.m. Extrapolations made during this period of 8 a.m. to 3 p.m. would indicate that if this rate is continued throughout the 24 hours, the total delivery for the day would be considerably in excess of the pipeline contract.

But the supply supervisor has seen this trend and has applied corrective measures so that by 4 p.m. the rate of flow has started to decline. The delivery rate falls until 1 a.m. when it begins to increase again and continues to rise until 8 a.m., the end of the ppieline day. At this time we find that the contract has been exceeded by less than 400 Mcf — well within the penalty limits.

Equipment

Equipment was purchased in 1954 for 23 orifice meter runs in 15 border stations, and for the line pressure in Granite City. Installation was completed in February 1955 just as the maximum day occurred for the 1954-1955 heating season. On that day one of the pipeline contracts was exceeded and a penalty of about $17,000 was incurred. Thus the story goes — so much for being tardy with the telemeter equipment. Penalties have been avoided since that February day, through the effective use of telemetering, except on one occasion when a small overrun cost about $80.

Ring balance flow meters are shown in Fig. 3. Fig. 4 shows an installation of slide wire receivers, totalizer, power packs and retransmitting equipment.

The border station for measuring gas delivered to Illinois Power Company's LaSalle area is shown in Fig. 5. Telemeter equipment is housed in the cabinets to the left of the meter and regulator building.

Fig. 6 illustrates the panel board in the Decatur system center. Excepting the thermometer in the lower right hand corner, the instruments with circular charts are receivers for pipeline individual metering points. The sections that look like card files contain the cyclometers for the receivers. There are two instruments with large strip charts. These provide a graphic record of the rate of flow from all telemetered points along the lines of two pipeline suppliers. The small strip chart receiver immediately above the office intercom records line pressure in Granite City. Wind velocity and direction are indicated by the instrument slightly to the left and above the intercom.

FIG. 7 to 11. Typical accuracy reports from four points are shown; special report is combination report summarizing the four individual reports.

Accuracy Report
E. St. Louis

Memorandum 2-7-57

1. E. St. Louis — M.R.F.C. — our chart 0-1000; Mcf constant for chart is 1.0 and for integrator 1.0.

Date	Pipeline Total	I. P. C. Integrator	% of Pipeline
1-25-57	3401	*3420	*100.559
1-26-57	3014	3010	99.867
1-27-57	2870	2887	100.592
1-28-57	3175	3186	100.346
1-29-57	3095	3105	100.323
1-30-57	3271	3313	101.284
1-31-57	3251	3282	100.954
Totals....	22077	22203	100.571

*Additions necessary due to failure of our equipment or signal. Latest date of maintenance on equipment was 1-11-57.

Gas Telemetering

Accuracy Report
Granite City

Memorandum 2-7-57

1. Granite City — M.R.F.C. — our chart 0-250, Mcf constant for chart and integrator is 10.0.

Date	Pipeline Total	I. P. C. Integrator	% of Pipeline
1-25-57	31182	30560	98.005
1-26-57	27553	26980	97.920
1-27-57	27966	27260	97.476
1-28-57	29372	28700	97.712
1-29-57	29054	28610	98.472
1-30-57	30548	29650	97.060
1-31-57	29215	28520	97.621
Totals....	204890	200280	97.750

Latest date of maintenance on equipment was 1-9-57.

Gas Telemetering

Accuracy Report
Wood River

Memorandum 2-7-57

1. Wood River — M.R.F.C. — our chart 0-400; Mcf constant for chart is 1.0 and for integrator 1.0.

Date	Pipeline Total	I. P. C. Integrator	% of Pipeline
1-25-57	3766	3760	99.841
1-26-57	3845	3860	100.39
1-27-57	3593	3562	99.137
1-28-57	3311	3294	99.487
1-29-57	3684	3663	99.430
1-30-57	3630	3605	99.311
1-31-57	3162	3126	98.861
Totals....	24991	24870	99.516

Latest date of maintenance on equipment was 12-14-56.

Gas Telemetering

Accuracy Report
Belleville

Memorandum 2-7-57

1. Belleville—M.R.F.C.—our chart 0-150; Mcf constant for the chart is 10.0 and the integrator is 1.0.

Date	Pipeline Total	I. P. C. Integrator	% of Pipeline
1-25-57	13151	13108	99.673
1-26-57	13195	13069	99.045
1-27-57	10535	10592	100.54
1-28-57	11241	11110	98.835
1-29-57	12831	12925	100.73
1-30-57	11953	12062	100.91
1-31-57	10513	10600	100.827
Totals....	83419	83466	100.056

Latest date of maintenance on equipment was 1-30-57.

Gas Telemetering

Special Accuracy Report
M.R.F.C. Totals

Memorandum Date: 2-7-57

Listed below is a comparison of the sum of gas consumption for Granite City, Wood River, and Belleville as billed by the pipeline with (1) the sum of our integrators for the same location and (2) our totalizer.
E. St. Louis included.

Date	Four Locations Pipeline Total	I. P. C. Integrator 4 Locations Total	I. P. C. Integrator 4 Locations % of Pipeline	I. P. C. Totalizer Integrator Total	I. P. C. Totalizer Integrator % of Pipeline
1-25-57	51500	50848	98.734		
1-26-57	47607	46919	98.555		
1-27-57	44964	44301	98.525		
1-28-57	47099	46290	98.282		
1-29-57	48664	48303	99.258		
1-30-57	49402	48630	98.437		
1-31-57	46141	45528	98.671		
Totals.....	335377	330819	98.641		

Latest date of maintenance on Totalizer equipment was_____.
Note: Washington Park, and Columbia remain at 6% of M.R.F.C. total.

Gas Telemetering

Alarms Prove Useful

High and low alarms were installed on the receivers in Decatur so that the operators are alerted if the load shows an unusual rise or fall.

A useful side result is the immediate warning of a line break or unusual flow of gas. One day the gas man in Kewanee decided to fill his holder. Now there is nothing out of the ordinary about filling a holder, but the gas supply supervisor in Decatur noticed a decided rise in the rate of flow through the sales station that serves gas to Kewanee. It seemed as though there could have been a large leak suddenly developed, so the gas man in Kewanee was asked to check. It was then found that the holder was being filled — that nothing was wrong. So the local gas superintendents were requested to advise the telemetering section when actions such as filling holders, blowing lines, or other heavy flows were planned.

On December 18, 1956, the supervisor heard the Hallsville high flow alarm sound at 12:55 a.m. The heavy flow continued and the superintendent in Clinton was advised. A large leak was found in the line from Hallsville to Clinton. The line was broken and

the leakage could have caused serious trouble if allowed to flow unchecked.

Accuracy Checks

Accuracy checks are made continuously so as to compare telemetered results with the pipeline record of daily deliveries. Two pipeline suppliers send delivery information daily. These data are used to make accuracy reports that go to our maintenance personnel.

Fig. 7 through 10 are typical accuracy reports for four delivery points along a pipeline. Note that the same period is covered in each report, for each border station. The reports are summarized in Fig. 11 with a small percentage being added so as to include two deliveries that are not telemetered. In all cases the telemetered quantities are compared to the pipeline billing figures and accuracy is based on the pipeline report of volume delivered.

If the accuracy of the telemeter equipment varies by more than two percent from the pipeline report, an investigation is made. In a few cases the pipeline has been found to be wrong, but sometimes the telemetering equipment is in need of some minor maintenance.

Maintenance follows closely on these accuracy reports. This is in addition to periodic inspection of border station and receiving equipment. Illinois Power Company is fortunate in having experienced electrical technicians available for the maintenance of its gas telemetering equipment. Good maintenance is essential and our maintenance men do more than cooperate — they advise and suggest, they find where trouble could start, and eliminate the "bugs" before trouble begins.

Exceptional maintenance has been responsible for the excellent accuracy obtained. The accuracy indicated in the reports is different from that stated by the vendor of this equipment. His verbal (not written) statement was that plus or minus two percent might be obtained; and probably plus or minus four percent of full scale might be a better figure; it all depended upon the skill and accuracy of maintenance.

Communication Methods

Various communications channels are used to transmit the flow data to the system center. Data leave the border station over a telephone pair. Some of these circuits terminate in a microwave station, as is the case for data accumulated along the Mississippi River pipeline. Data from Belleville, East St. Louis, Granite City and Wood River are sent to a microwave station in Wood River. Then the flow data are transmitted over the microwave system to Decatur.

Microwave is also used to transmit flow data originating in Kewanee and LaSalle to Decatur.

Galesburg flow data are transmitted over a power carrier circuit to Decatur.

All other locations use telephone circuits for the entire distance to Decatur.

Illinois Power has an underground storage project almost ready for the construction stage. Its control will require the installation of telemetering equipment so as to cooordinate the use of storage and pipeline supply.

FIG. 12. Propane-air plant at Jacksonville used for peak-shaving purposes.

Weather Data Vital

In the winter time, when the peak days are imminent, the best weather forecasts obtainable are needed. It is only through knowledge of impending weather that the supply supervisors are able to estimate gas requirements. Barring accidents, it is the heating and other firm commitments that determine the severity and extent of curtailments, the operation of production facilities and the use of gas in storage.

In order to have some idea of weather conditions Illinois Power has subscribed to a commercial weather forecasting service. In addition there is a weather teletypewriter machine installed in the gas telemetering office. The machine is connected to the United States Weather Bureau office so that information released from that office is received at once on this teletypewriter. In this way the trends in the weather are known and gas loads can be adjusted to match pipeline contracts.

Peak Shaving Operations

If it appears that pipeline contracts will be exceeded, industrial gas contracts can be interrupted in favor of firm gas customers. If more gas is needed than is available after interruptions are made, gas manufacturing plants are started to supplement the supply. Illinois Power has 18 propane plants, three high Btu carburetted water gas and one oil gas plant.

In connection with the manufacture of supplemental gas two new propane peak shaving plants have been completed recently. Fig. 12 shows one of these plants under construction.

These plants can make gas at 115 psi, and mix this with the incoming natural gas at any predetermined percentage, thus making the output of these plants completely deliverable to the distribution systems involved. The mixture is controlled by allowing all of the natural gas to flow through an orifice plate. The differential across the orifice provides an impulse that allows more or less peak shaving gas to enter the final mixture according to whether or not the differential is higher or lower. The heating value of the peak shaving gas is adjusted according to the percentage of peak shaving gas used.

The effect of peak shaving is quickly registered on the telemeter receivers, so that the gas supply supervisors know when a plant goes on the line, and also the extent of operation. That is, the supervisors know, from observing the receivers, how much peak shaving gas is being made.

When peak shaving gas is required the supervisors telephone to the area in which a plant is located and advise the plant operators that gas is needed.

When sufficient gas has been produced, another call is made to stop the plant operation. Correlation of natural gas deliveries and produced gas is easily made so that contracts are not exceeded.

In the gas telemetering section there is a gas supply supervisor and three assistant gas supply supervisors. The four men each work five eight-hour shifts covering 160 of the 168 hours a week. One eight-hour period from 12:01 to 8 a.m. Sunday is left vacant since the load is lightest at that time. These men do an excellent job of attending receivers, gathering essential load data, plotting daily load curves and alerting the proper persons in case of trouble or of high load conditions.

Acknowledgment

This article was prepared from a paper presented at the 1957 AGA Gas Supply, Transmission, and Storage Conference, San Francisco. ★ ★ ★

AMERICAN
Gas Fundamentals

NATURAL GAS

A CONTINUING EDUCATIONAL AND REFRESHER COURSE IN
GAS TECHNOLOGY — OPERATIONS — EQUIPMENT — MANAGEMENT — UTILIZATION

Methods of Drilling for Gas and Oil

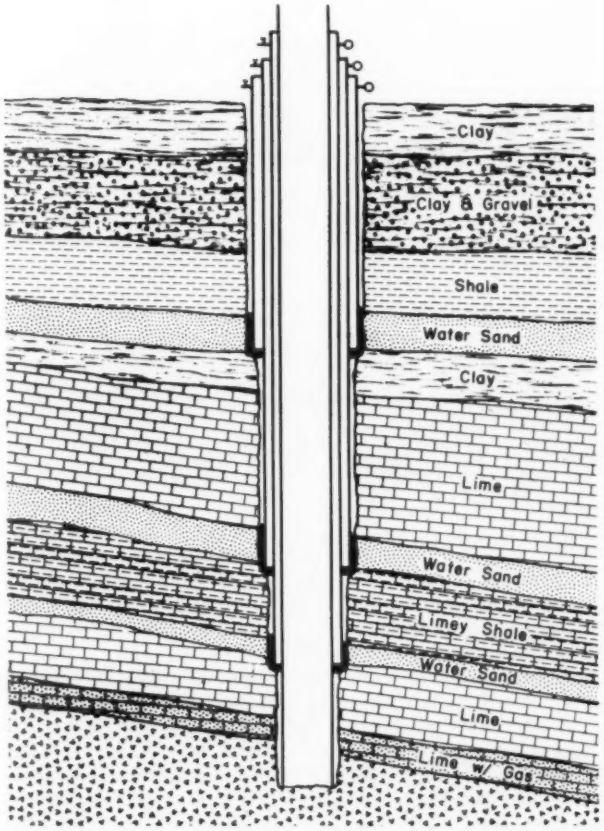
Part 2

Pressure Control

In earlier days, when gas or oil was encountered under pressure it blew freely out of the hole until it could be captured at the well head. The term "gusher" originated with this practice. It was certainly a dramatic sight to watch a roaring, belching column of gas, oil, and mud wildly spraying above the derrick. But it was also wasteful and extremely dangerous. Today, there is a planned program that starts at "spudding" for controlling any pressures that may be found underground. Prevention of the escape of high pressure gas or oil is one of the functions of drilling mud. For this purpose, mud is weighted with additives to make it much heavier than plain water. The additional materials have to stay in suspension and move with the fluid so it can be handled as a liquid. Weight of the mud at the bottom of the hole is translated into pounds per square inch. This pressure must be kept in excess of any gas in the hole to restrain the gas. In the event the balance of pressure favors the gas there will be a blow-out.

There is another way of preventing this occurrence. All adequate modern drilling rigs are equipped with *blow-out preventers* at the top of the hole. These valves, fastened to the surface casing, close around any pipe that may be in the hole to prevent the escape of anything on the outside of the drill pipe. Master gate valves close the unoccupied hole. Above the kelly is a valve known as the *kelly cock*, which can be closed to stop any blow back through the inside of the drill pipe.

The blow-out preventer would be useless without an anchor to hold it down. When a well is begun and has been drilled a safe distance, the first string of casing is set. The exact depth depends on the nature of the formation, the presence of fresh water sands to be protected from contamination, and how well the casing can be cemented to the formation. With drill pipe and bit out of the hole, the casing is run in a similar manner to the running of drill pipe. After the casing is in place, cement is forced down through the pipe until it comes up and around the outside of the casing. Very little cement stays in the casing as the slurry is pushed ahead of a plug and a column of clear water. After the cement has set, the plug at the bottom of the casing is drilled out and progress continued on the making of hole.

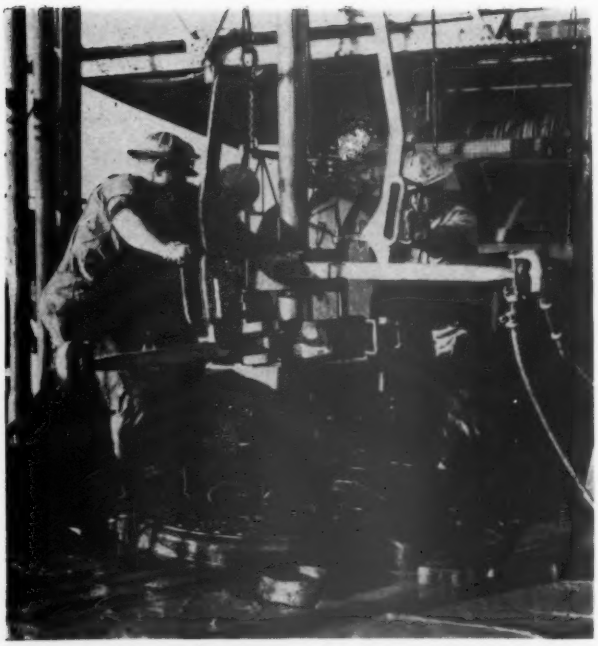


Multiple strings of casing are set to control water sands and high pressure gas.

Auxiliary Equipment

Most basic elements of drilling rigs have been discussed, but some mention of the auxiliary equipment required indicates the complexity of the modern drilling enterprise. Most rigs are equipped with *shale shakers* of either the vibrating screen or rotating barrel types. All have *generators* for lighting and the operation of electrical devices. Almost all are equipped with *instruments* to measure straight hole. There are *air compressors* for activating control machinery as well as *hydraulic pumps* for the same purposes. Every rig has a supply of *hand tools* ranging from simple hatchets to expensive torque wrenches.

There is also *safety equipment* in the form of first aid kits and fire extinguishers. Some fishing tools are normally present although the majority of fishing tools are rented from specialty houses. Storage and housing problems are answered in the ever present dog-houses, tool houses, engine houses, mud houses, and bunk houses.



Roughnecks like these on drilling rig in Louisiana swamplands, pull pipe, change bits, and perform other normal drilling rig tasks that call for split-second timing.

Some of the equipment necessary to move the rig and to transport pipe and supplies may accompany the rig. There are numerous variations in auxiliary equipment resulting from the area of operation and season. In the cold climates one finds winterizing materials and on the Gulf Coast bug fans to dispel mosquitoes and other insects.

Men Who Run the Rigs

Rigs must be run by men who are skilled in the techniques of drilling and in solving the problems that arise on their jobs. To do their work properly these men must have a wide range of knowledge.

At the top of the drilling organization, for either cable or rotary tools, is the drilling superintendent. He coordinates the work of several rigs, selects and supervises toolpushers, and generally follows through to see that each job is being done properly. He establishes the policy of operations and makes decisions on major purchases and repairs. In time of crisis, as in the case of very difficult fishing jobs, he may assume direct control of operations. Toolpushers usually report daily to the drilling superintendent.

A key position is occupied by the toolpusher. This man is in direct charge of drilling operations. He is responsible for each hour of the drilling day. He coordinates the work of the drillers, interprets work policy in concrete terms of immediate tasks and sees that instructions are understood and followed. His is the job of crowding or "pushing" the work to completion—hence his title.

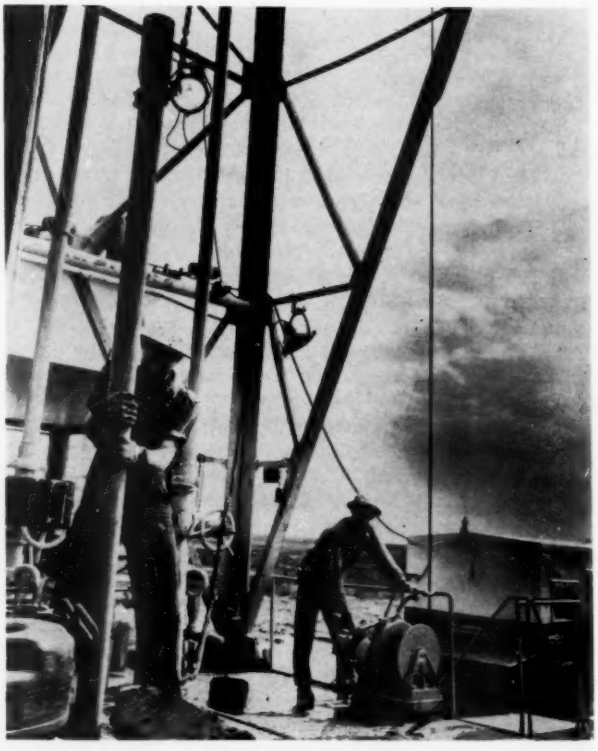
Normally, there are three crews on each rig, each working eight hour shifts. These work periods are known as morning, day, and evening tours. This is pronounced "tower" in the oil fields although spelled t-o-u-r. Each tour has its traditional duties except in emergencies.

Both cable and rotary tools employ a driller who heads the crew. He hires and fires his crew members and there are few exceptions of interference from the toolpusher. This privilege is accorded because of the close contact and precision teamwork required of the men. The rotary driller may have from three to five helpers depending on the type and size of his rig: A derrick man, who handles the pipe up in the derrick; an engine man or fireman whose duties are concerned with the prime movers, and several helpers, called floormen, who handle the tongs, spinning line, and catheads during trips and maintenance work when not thus engaged. The cable tool driller has as his chief assistant the tooldresser, who is a sort of combination mechanic and blacksmith. Principal duty of the tooldresser is to keep the drilling bits sharp. These men in turn have from one to three helpers.

Crews work together during the time of rigging up. After the equipment has been moved to location it must be assembled for operation. One crew may lay water lines, another makes the slush pump connections, prepares pits and digs drainage ditches. The third may make chain or V-belt connections or install the rotary table or dig the rathole. The pattern of work assignments while rigging up is almost as varied as the number of toolpushers in the business.

When the drilling equipment is assembled to the point that it can be operated, the rig is ready to "break tour." This is the term used to designate that the crews will henceforth work within their regularly assigned periods and that work will proceed continuously for 24 hours every day until the total depth is reached.

After breaking tour, the hole is "spudded," indicating the beginning of drilling operations. Within a few hours or days after spudding the surface pipe is set. During this whole period the final touches may be put on rigging up for the long job of drilling the main hole. And after cement has set on the surface hole the entire organization settles down to the real business of drilling.



Section of drill pipe is set in "rathole" before being added to drilling string.

Problems of Drilling

The tedium of drilling is relieved by numerous problems. The proper bits must be selected for each formation to make the maximum hole in the minimum time. Bits must not be pulled "green" (before being worn out) or kept in the hole beyond their useful life. Weight on bottom must be agreed upon and maintained. Speed of rotation must be proper for the area and formation. Mud quality and quantity must remain adequate. Prime movers have to be kept in operation. And the work has to continue through hail, sleet, snow, broiling sun, and driving rain for 24 hours each day, seven days in every week.

Keeping the hole straight is one of the constant problems. Surveying devices are used to measure the number of degrees off vertical at stated intervals. If there is a tendency for the hole to drift away from the vertical, the weight on bottom and rotation speed must be altered to correct the deficiency. Or, in extreme cases, whipstocks are set to bring the hole back in line.

During the entire time that drilling is going, a record is kept of the hole. This may be only a driller's log showing the footage changes in formations as interpreted by the drillers. Or a mechanical instrument may record the drilling time and rate of penetration. Samples of the cuttings will be taken at regular intervals and may be examined at the drilling site or sent to the paleontological laboratory to establish the geological log. Drilling crews catch samples of cuttings from the mud for each 5 or 10 ft of hole drilled as required. They then wash and dry the samples carefully before placing them in labeled sacks.

There are many important jobs that must be done to complete a well. These vary greatly and are complicated enough to require a separate discussion. The setting of casing, coring, swabbing, acidizing, shooting, fracturing, squeezing, perforating, electric logging, temperature bombs, testing, etc., are all involved in the techniques of bringing in a successful gas or oil well.

Driller's eye view of inside of derrick.

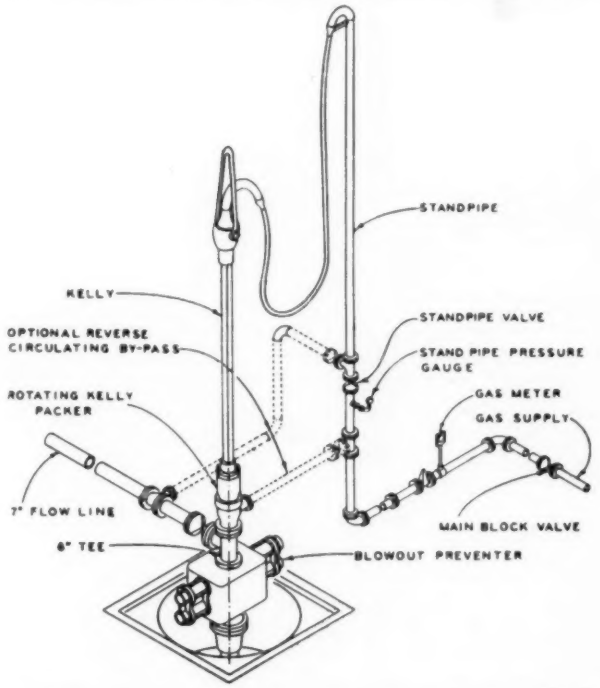


Diagram illustrates gas drilling hookup where gas is used in place of mud. Similar hookup used when air is used as circulating medium — air being supplied by compressors.

Throughout the drilling process and in the completion of wells, time is of the utmost importance. The cost of drilling wells is so closely related to time that all modern drilling techniques are geared to the reduction of the time of operations to the greatest degree commensurate with safe practice. In some cases, the shortest possible time, as with trips, is not always the cheapest.

Safety must be kept constantly in mind as accidents on a drilling operation can be very expensive. A hand wrench may be dropped to the floor of your room and only create a disagreeable noise, but the same tool falling accidentally into the bore hole may cost hundreds or thousands of dollars.

The highest costs of drilling are those that recur daily, regardless of progress made with the hole. Men have to be paid. Fuel continues to be burned. Machinery must be maintained and supplies purchased. With the daily cost, for rotary drilling, ranging from $600 to $3000 per day, any loss in time quickly converts to a substantial cash loss.

There are many dramatic variations of the drilling procedure such as offshore wor kwith equipment mounted in ocean going barges. Or, the highly interesting employment of gas or air as the circulatory medium to replace conventional mud. Turbine drills and sonic penetration are available for special tasks. But basically, the fundamentals are the same as those reviewed above.

In one particular way all drilling methods are alike. When the job has been finished these gypsy factories must move on. After completion they all "tear down" or dismantle for moving. This is the final action on each well after it has been drilled and "brought in" to produce gas and oil for the consumer of tomorrow.

Acknowledgment

The two chapters on "Methods of Drilling for Gas and Oil" were prepared by W. K. Powell, president, Beard Drilling Company, Inc., Duncan, Oklahoma. ★ ★ ★

Employees of Arizona Public Service Company's System Gas department designed this convenient building to service the company's large inventory of construction warning lanterns. The building has three sliding walls which enable the attendant to reach any lantern without going outside the building. Dirty and empty lanterns are placed on the rack on the right and after being completely cleaned and checked, the lanterns are placed on the other rack ready to go out on another job.

Ideas at Work

Assembly Line Sudsing

Keeps Warning Lanterns Sparkling

Jack Childers
Arizona Public Service Company
Phoenix, Arizona

Lonnie Davis, operator of Arizona Public Service Company's lantern shop, runs a lantern through an assembly line maintenance check. During this checking routine, the lantern is cleaned, wick adjusted and the tank refueled. Capacity of the shop is 600 lanterns and up to 250 have been processed in a single day.

FAMILIAR SIGHTS to the nation's night-driving public are the glowing red lanterns used to mark areas under construction.

Most people probably murmur a subconscious word of thanks for the warning of hidden danger, but to the men who place them about, these warning lanterns are a very tangible item.

Lanterns are standard equipment on all gas trucks for use in marking excavations and obstructions resulting from construction work. The practice of setting warning lanterns at night is carefully carried out even in desert locations where the only creature stirring might be a kangaroo rat.

Arizona Public Service Company gas officials had long sought a solution to the routine servicing of lanterns. Finally, Bill Fielder and Terry Smith, System Gas staff supervisors, and Roy McLaughlin, gas foreman, discussed the problem, put their ideas on paper and turned the plans over to George Foote, equipment maintenance and construction foreman. The result was a modern shop capable of maintaining a constant supply of lanterns.

The shop is of metal construction with sliding walls and storage racks on three sides. Dirty lanterns are delivered at one of the racks and the supply is immediately replenished from fresh stock on the other two racks.

Dirty lanterns are cleaned, wicks and mechanical operation checked, refueled, and racked. Unique design of the building permits the attendant, Lonnie Davis, to reach any lantern without going outside the building.

Inside the building is a work table with a perforated area and a drain over which the lanterns are cleaned. Within easy reach of the attendant are air, water and kerosine for the servicing operation.

Each dirty lantern goes through several steps before it is placed back in service. First the glass bowl is washed, soot and dirt is then blown off the lantern, the wick is checked and adjusted and the lantern refueled.

The shop capacity is 600 lanterns, and up to 250 have been processed in a single day. ★ ★ ★

COMING EVENTS

IN THE GAS UTILITY INDUSTRY

July

8 Gas Technology Short Course, North Carolina State College, Raleigh, North Carolina.

8-12 National Housewares & Home Appliance Manufacturers Exhibits, Atlantic City, New Jersey.

22-26 Western summer radio-television and appliance market, Western Merchandise Mart, San Francisco, California.

28-August 9 Sixth Utility Management Workshop, Columbia University, Arden House, Harriman, New York.

August

26-28 Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, West Virginia.

September

3- 5 Pacific Coast Gas Association Convention, San Francisco, California.

4- 5 AGA operating section organization meeting, Sherman Hotel, Chicago.

6 New Jersey Gas Association, annual meeting, Spring Lake, New Jersey.

9-13 AGA Industrial Gas School, Hotel Penn-Sheraton, Pittsburgh, Pennsylvania.

10-12 Mid-West Gas Association, gas school and conference, Iowa State College, Ames, Iowa.

11-13 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, New Jersey.

11-15 National Hotel Exposition, Coliseum, New York, (AGA will exhibit.)

12 NEGA safety conference, Hotel Statler, Boston, Massachusetts.

13-14 Maryland Utilities Association, 33rd annual fall conference, The Cavalier Hotel, Virginia Beach, Virginia.

16-18 AGA 9th annual accident prevention conference, St. Louis, Missouri.

18-20 Southeastern Gas Association convention, Robert E. Lee Hotel, Winston Salem, North Carolina.

20-21 Public Utilities Association of the Virginias, annual meeting, Greenbrier Hotel, White Sulphur Springs, West Virginia.

23-25 ASME, fall meeting, Statler Hotel, Hartford, Connecticut.

October

1- 4 NACE, south central regional meeting, Municipal Auditorium, Oklahoma City, Oklahoma.

7- 9 AGA annual convention, Kiel Auditorium, St. Louis, Missouri.

10-12 ASME Fuels-AIME conference, Chateau Frontenac, Quebec, Canada.

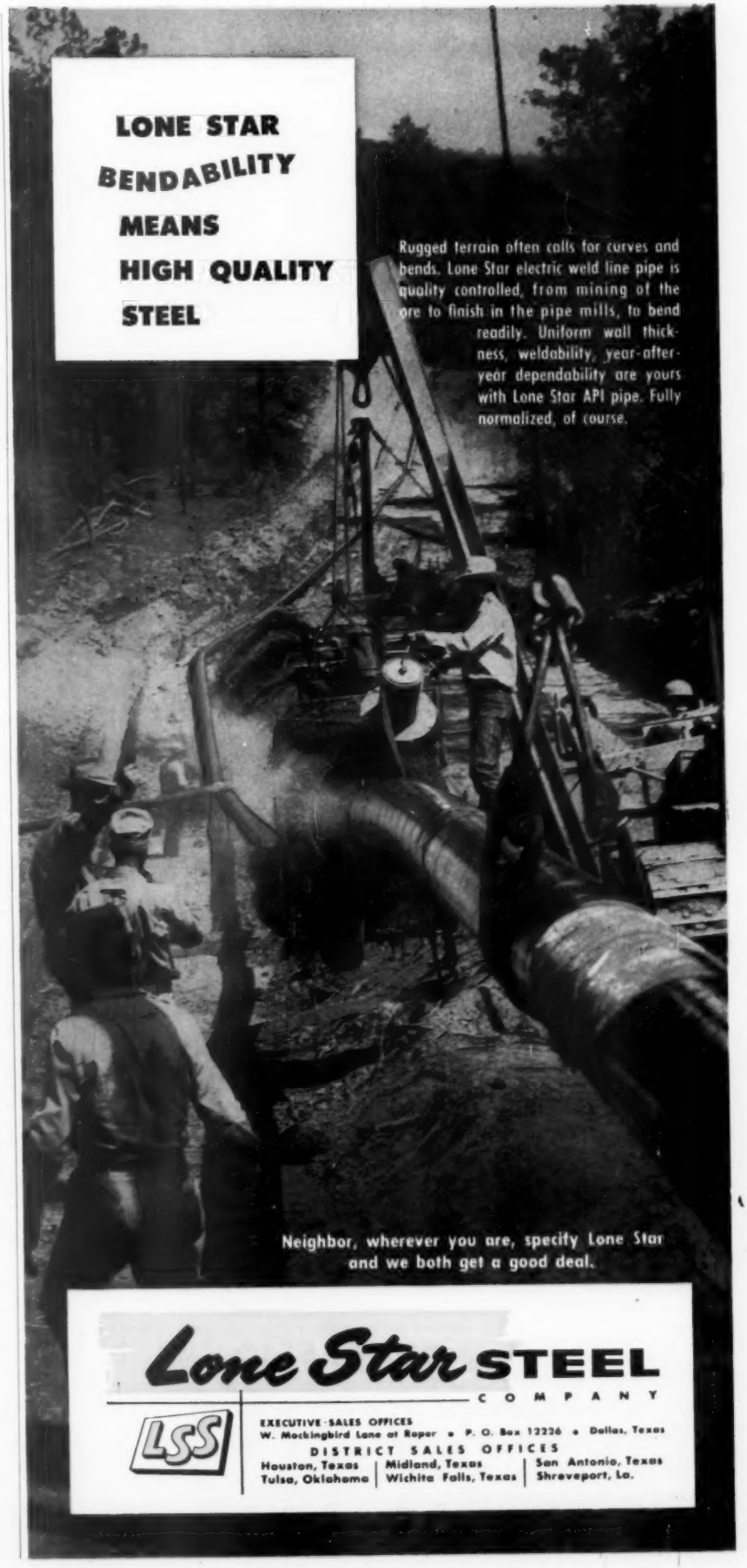
16-18 Wisconsin Utilities Association, annual convention, Schroeder Hotel, Milwaukee, Wisconsin.

23 NEGA street department supervisors group, Hotel Bancroft, Worcester, Massachusetts.

November

4- 8 National Metal Exposition, Chicago, Illinois. (AGA will exhibit.)

6 NEGA Operating Division, Hotel Statler, Hartford, Connecticut.


LONE STAR
BENDABILITY
MEANS
HIGH QUALITY
STEEL
Rugged terrain often calls for curves and bends. Lone Star electric weld line pipe is quality controlled, from mining of the ore to finish in the pipe mills, to bend readily. Uniform wall thickness, weldability, year-after-year dependability are yours with Lone Star API pipe. Fully normalized, of course.
Neighbor, wherever you are, specify Lone Star and we both get a good deal.
Lone Star STEEL
COMPANY
LSS
EXECUTIVE-SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas
DISTRICT SALES OFFICES
Houston, Texas
Tulsa, Oklahoma
Midland, Texas
Wichita Falls, Texas
San Antonio, Texas
Shreveport, La.

Breaking ground for Northern Illinois Gas Company's new headquarters near Joliet are Paul Friedrich, Joliet Councilman; Marvin Chandler, president of Northern Illinois; and George O'Brien, assistant Joliet Township supervisor. The new approximately 20,000 sq ft headquarters scheduled for completion late this year will house facilities for Northern Illinois' Joliet area operations, construction, sales, service, and transportation departments. It will also provide space for the company's southern division administrative activities.

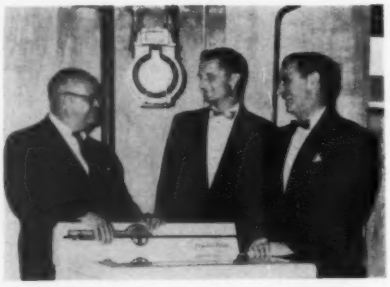
Flaming — Four manufacturers of gas equipment and one manufacturers' representative were honored in New Orleans during the AGA Commercial and Industrial Gas Conference as new members of the "Hall of Flame." The manufacturers are: *John T. Heilig*, vice president and sales manager, Savory Equipment Inc., Newark, New Jersey; *Andrew M. Bornhofen*, vice president in charge of sales, Anetsberger Brothers, Inc., Northbrook, Illinois; *Richard E. Regan*, general manager, Gas Consumers Service, New York; and *Everett Magnuson*, vice president in charge of boiler sales, Eclipse Fuel Engineering Company, Rockford, Illinois. Also honored was *Herman Koester, Jr.*, president of W. Wirth Young & Associates, Boston. The five received jeweled insignia and certificates of life membership in the honorary group.

Changing—Stockholders of International Metal Industries, Limited have voted to change the firm's corporate name to John Wood Industries Limited. The name will be officially adopted as soon as Letters Patent is secured from the Secretary of State of Canada.

Merging — United Pipe Line Contractors, Inc., of Beloit, Wisconsin, has recently announced the merger with it of United Pipe Utility Suppliers, Inc. The firm engages in gas and water pipeline construction, principally in Wisconsin and Illinois and manufactures pipeline equipment and supplies that are distributed all over the country.

Shortening — The name of Union Carbide and Carbon Corporation has been shortened to Union Carbide Corporation and the names of three divisions of Union Carbide have also been changed. Carbide and Carbon Chemicals Company has become Union Carbide Chemicals Company; Linde Air Products Company is changing its name to Linde Company; and Carbide and Carbon Realty Company will be known as Union Carbide Realty Company.

Winning — Southern Union Gas Company has won four awards, Oklahoma Natural Gas Company two awards, and Northern Indiana Public Service Company one in the 1957 "Better Copy Contest" held by the Public Utilities Advertising Association. Southern Union won a first place award in outdoor advertising, second place awards each in single newspaper advertisement on any subject, and institutional radio advertising, and a third place award for sales promotion or direct merchandising television advertising. Oklahoma Natural took first place certificate for interior displays and a third place certificate for employee magazines. Northern Indiana 1956 annual report to stockholders took first place award in the contest.



Memorializing its 6-millionth customer, Sprague Meter Company of Bridgeport, Connecticut, recently presented a "Golden" gas meter to a new home in the Framingham franchise area of Worcester Gas Light Company. At the ceremony, which included presentation by Sprague of a new gas dryer to the home owner, were left to right, Sprague Meter Company president, F. Leslie Fairchild; Framingham Division manager Donald Story and Worcester Gas Light Company president R. J. Rutherford.

Cincinnati Gas & Electric Company has announced that construction on a new $400,000 gas service building in Green Township near Cincinnati will begin about July 1. When completed in the late fall, the new operation will facilitate gas service in the western section of Hamilton county. The new building will house offices, customer service and construction forces, garage, and warehouse units of CG&E's gas department. Many of the gas department's employees and much of its equipment now located in Hartwell will be transferred to the new service building.

Constructing — Natural Gas Storage Company of Illinois has received a temporary certificate from the FPC and has begun construction on its Cooks Mills storage field project south of Arcola, Illinois. Included are a compressor station, dehydration plant, and meter station in the area near the Coles-Douglas counties border. Cooks Mills will be operated as a supplement to NGS' Herscher storage field in order to extend the winter natural gas deliverability period of NGS, but there will be no increase in the total amount to be withdrawn from storage on the peak day. Two non-associated gas reservoirs in the Cypress and Rosiclare underground formations are included in the storage area. Completion date for the project is slated for December.

Taping — Polyken Sales Division of The Kendall Company has added three new distributors for its protective tape coatings line. Aetna Sales Company of San Francisco and Farwest Corrosion Control Corp. of Seattle with branch offices in Los Angeles, will provide increased services for Polyken for the West Coast. William Cluff Corp. of Tulsa, Oklahoma, will provide increased service to the Southwest and Rocky Mountain area.

Forming — Somerville Construction Company of Ada, Michigan, has formed a subsidiary company in Peoria, Illinois, to be known as the Somerville-Illinois Company. The new subsidiary will specialize in construction and maintenance of gas pipelines and distribution systems in the central states area. Joe Boyd has been named general manager with Neil VandeSchraaf as office manager.

Distributing — Hills-McCanna has appointed Gulf Supply Company, Inc. as an exclusive stocking distributor for Hills-McCanna diaphragm valves and replacement parts in Western Louisiana and Central and Eastern Texas.

PROFESSIONAL DIRECTORY

Engineers, Designers and Manufacturers of
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and special equipment for every requirement
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★ 100% Town Supply
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11 WEST 42ND STREET
NEW YORK 36, N. Y.

News

New "Trade Mark" unveiled by Tuck-Aire Furnace Company features the word "Tuck-Aire." Formerly the International Sales Company, the firm name was changed effective the first of the year. The change in company name and the significance of the new trade mark is to form a closer association with the founder of the company, George A. Tuck.

Dealer education program has been expanded by Appliance Division of Motor Wheel Corporation to establish a seven-man field training staff. New program is aimed at aiding dealers sell as well as maintain and repair Motor Wheel appliances.

Under an agreement with Combustion Engineering, Inc., L. O. Koven & Brother, Inc. of Jersey City, New Jersey, has announced it will manufacture and sell the entire line of domestic water heaters and tanks previously manufactured and sold by Combustion. This line includes both gas and electric types of automatic water heaters sold under the trade names Heatmaster and Perfection.

New York Distributor—Temco, Inc. of Nashville, Tennessee, has appointed H. A. McRae & Company, Troy, New York, as product distributor in the Hudson Valley territory in New York State.

In the Upper Midwest—Gas distribution department has been formed by Ralph D. Thomas and Associates, Inc., consulting engineers of Minneapolis, Minnesota. Complete consulting services will be offered both municipal and private utilities in the Upper Midwest. D. I. Overland has been appointed engineer in charge of the department.

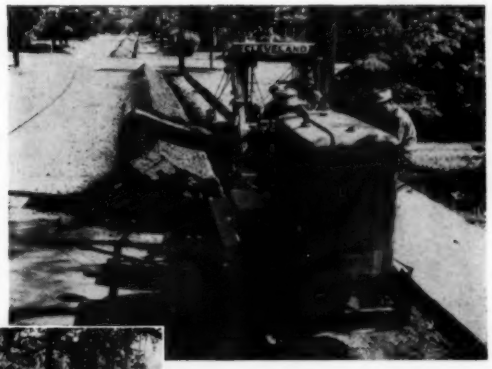
Walter H. Dyer has been appointed editor of the AGA Monthly. He was formerly editor of publications for the Mueller Company. At the American Gas Association he succeeds Vaughan O'Brien, who has been named secretary of the association's General Management Section.

Ed Parkes, executive vice president of United Gas Corporation, has been named chairman of the American Gas Association Committee on Natural Gas Reserves. He succeeds N. C. McGowen, chairman and president of United Gas Corporation who had served as chairman of the committee since its formation in 1946.

Corrosion Protection — The American Zinc Institute has just published two reference manuals describing the use and application of zinc as a galvanic anode to protect iron and steel from corrosion. Titled "Zinc as a Galvanic Anode Underground" and "Zinc as a Galvanic Anode Underwater," the two new AZI publications were developed as a result of a six-year project of investigation undertaken with the help of Ebasco Services, Inc., a New York City firm of consulting engineers.

Zinc is considered the ideal element for anode use in systems for cathodic protection of iron and steel because it is freely available, economical, and it produces adequate and self-regulating current when coupled to iron and steel. Most simply engineered and installed, it delivers adequate current without impractical size, numbers, or spacing of units.

DIGS STRAIGHT



DIGS CLOSE

DIGS FAST

Etowah Construction Company uses its Cleveland 95's compactness and shiftable conveyor to advantage on this utilities job in Franklin, Tennessee.

The Cleveland 95 "Baby Digger"—built by the Pioneers of the Modern Trencher, originators of *every* important trencher design feature—makes money for its owners because it . . .

- ***fits more jobs***—digs to 5½' deep x 24" wide.
- ***digs all soils***—full-size engine, over 30 graduated power and speed combinations.
- ***digs faster***—more bucket capacity, more wheel-and-crawler combinations.
- ***saves property damage***—full crawlers, easy on lawns and sidewalks.
- ***lasts longer***—quality construction and materials mean longer life—it's in the records.

THE CLEVELAND TRENCHER CO.

20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

Good Everywhere

Men At Work IN THE GAS UTILITY INDUSTRY

New "Veeps." Three veteran members of the supervisory staff of Mid-South Gas Company have been elected vice presidents. Left to right are Richard P. Hill, sales manager, who in addition to being elected a vice president, was named a new member of the board of directors; F. P. Clark, 35 year veteran in the public utility field; and R. A. Bautts, Mid-South's manager of operations. All three men have been with MidSouth since its organization in 1950.

N. D. Travis

W. M. Hutchins

● **Noble D. Travis** has been appointed director of public relations of Michigan Consolidated Gas Company. Travis joined Michigan Consolidated after 27 years with the Detroit Trust Company where he has been vice president in charge of public relations since 1945. **William M. Hutchins** has been appointed director of press relations. He has been director of public relations for the company's outstate districts since 1951.

● **F. D. Campbell,** president of New England Gas and Electric Association since 1938, has been elected chairman of the board of trustees. **John F. Rich** has been named to succeed him as president and chief executive officer. Campbell will continue on a full-time basis until his retirement September 1, and thereafter will act as chairman and consultant.

J. F. Rich

E. G. Campbell

● **Ernest G. Campbell,** general superintendent of distribution for The Peoples Gas Light & Coke Company of Chicago, has retired after 37 years of association with the gas industry, to become a manufacturer's representative for Perfex Plastics, Inc., Chicago.

● Directors and officers of Spokane Natural Gas Company were re-elected at the annual stockholders meeting. Re-elected directors were: **Nathan H. Gellert Jr., Ben H. Hoke, Charles J. Melrose,** and **Frank A. Woodworth,** all of Spokane; **Ray C. Fish** and **Alfred C. Glassell Jr.,** both of Houston, and **N. V. Kinsey,** of Shreveport.

● **Kirk P. Harger** has been assigned to the New York offices of Kerotest Manufacturing Company as eastern sales representative-Steel Valve Division.

● **George F. Varga** will head the new Boston district sales office of Roots-Connersville Blower, Division of Dresser Industries, Inc.

● **Louis Norheimer,** production control manager of Tube Turns, has been elected treasurer pro tem of the newly established American Production and Inventory Control Society.

E. N. Henderson

B. E. Harrell

D. W. Weir

● Three executives of Arkansas Louisiana Gas Company have been elected to newly created vice presidencies of the company. They are: **E. N. Henderson,** chief engineer since 1954; **B. E. Harrell,** who serves as manager of gas supply and sales; and **D. W. Weir,** who has served as assistant to the president.

● **William A. "Bill" Green,** executive vice president of MidSouth Gas Company, has retired after 35 years with Mid-South and predecessor companies. He will be retained by the company on an advisory and consulting basis.

● **Kurt W. Fleischer** has been elected vice president of the Fluid Processing Division of Selas Corporation of America.

● **Ray R. Eppert,** executive vice president of Burroughs Corporation, has been elected to the board of directors of Michigan Consolidated Gas Company of Detroit.

● **Herman Gottwald** and **Donald C. Morgan** have been named assistant vice presidents and production managers of Rockwell Manufacturing Company's Meter and Valve Division. Gottwald will be in charge of valve sales, and Morgan in charge of gas products sales. **Robert A. Johnson** succeeds Gottwald as eastern regional sales manager. Succeeding Morgan as central regional sales manager is **Thomas O. Carson.**

● **John F. McGuckin** has been appointed gas sales manager of Philadelphia Gas Works, Division of The United Gas Improvement Company.

J. F. McGuckin

Herbert Parker

● **Herbert Parker,** sales engineer in the Atlanta, Georgia, district office of Rockwell Manufacturing Company's Meter and Valve Division, has been promoted to Atlanta district manager.

● Two Shreveport men have been promoted to important positions in the executive ranks of United Gas Corporation. They are: **Fred M. Odom Jr.,** who has been elected a vice president to fill the vacancy created by the promotion of **J. H. Miracle** to treasurer. **B. M. Byrd** has been named secretary of United Gas succeeding **B. H. Winham,** who died April 15.

● Three executive appointments at Milwaukee Gas Light Company have been announced: **Lloyd J. Klein,** an attorney and public utility consultant, has been elected vice president of economic planning and research, a new position in the company; **Earl G. Frank,** assistant secretary and assistant treasurer since 1948 was elected secretary. He succeeds **Paul J. Imse** who retires November 1. **Frank Lipsky,** chief general accountant and budget director, has been appointed assistant treasurer to succeed Frank.

● Brooklyn Union Gas Company has announced the retirement of **Morton O. Davis** who has been treasurer of the company since 1946, and employed by Brooklyn Union for 46 years. Succeeding Davis will be **Gordon C. Griswold** who has been elected both vice president and treasurer of the company.

L. B. Schiesz

H. G. Horstman

● Climaxing a brilliant 45-year career in the public utility field, **L. B. Schiesz,** president of Indiana Gas & Water Company, Inc., has been elected to the position of chairman of the board. **Herman G. Horstman,** vice president, has been elected president.

● Permaglas Division of A. O. Smith Corporation has announced the appointment of **Frank K. Toney** as utility specialist for the southeastern United States.

W. T. Stevenson

W. T. Stevenson suffered a fatal heart attack at his home at Owensboro, Kentucky, on May 22. He was president of Texas Gas Transmission Corporation, chairman of the board of directors of its wholly-owned production subsidiary, Texas Gas Exploration Corporation president of Western Kentucky Gas Company, and president of its wholly-owned L-P gas subsidiary, Kengas, Inc.

Long recognized a leading member of the nation's natural gas industry, he was a vice president and member of the board of directors of the Independent Natural Gas Association of America at the time of his death, and had been a director of the AGA.

Born at Leavenworth, Kansas, on June 10, 1900, Stevenson was graduated in 1923 from the University of Kansas. He was in the banking field until 1926 when he was introduced to the natural gas business as an employee of Arthur Andersen & Company, public accountants. In 1928, he was assigned to do work for early predecessor companies of Texas Gas Transmission Corporation, and the following year accepted a position with them. When Kentucky Natural Gas Corporation was formed in 1933 out of the earlier companies, he was elected assistant treasurer. In 1942 he was elected Kentucky Natural Gas Corporation's vice president and treasurer, and also became president of Western Kentucky Gas Company, then a subsidiary of Kentucky Natural but now an independent company.

When Texas Gas Transmission Corporation was formed in 1945, Stevenson was made an officer and director of it and of Memphis Natural Gas Company. He became executive vice president of Texas Gas in 1948 when Kentucky Natural and Memphis Natural were merged into Texas Gas.

He was elected president of Texas Gas in May, 1951, and served in that capacity until his death.

Fred W. Schmidt

Fred W. Schmidt, secretary-treasurer of The Roberts Brass Manufacturing Company, Mitchell, Indiana, died May 13 in Indianapolis after a short illness.

Art Theobald

Art Theobald, chief engineer for Sequoia Manufacturing Company, San Carlos, California, died suddenly April 25 of a heart attack. His career in the heating and air conditioning industry started in 1921. He helped organize and was a charter member of the Institute of Heating and Air Conditioning Industries.

David S. Reynolds

David S. Reynolds, New England representative for The Gas Machinery Company, Cleveland, died at Robert Breck Brigham Hospital in Boston March 31. He had been ill about a year. Reynolds was instrumental in many outstanding gas installations in New England. His gas experience, all in New England, totalled 54 years.

● **Mrs. Elsie Alcorn,** home economist and kitchen planning specialist for the Milwaukee Gas Light Company has become home service director of the utility. She will succeed **Mrs. Ella Liner Lambert,** the founder and first director of home service activities, who has retired.

● **Hayes S. Walter** has been named commercial promotion manager in the AGA Promotion, Advertising and Research (PAR) program. **Gerald P. Mullins,** formerly with Lennen and Newell advertising agency, has been named assistant to PAR promotion manager **Charles R. Bowen.**

● **Raymond J. Fitzgerald** has been named auditor of the American Gas Association. For the past four years he has served on the staff of the AGA Bureau of Statistics.

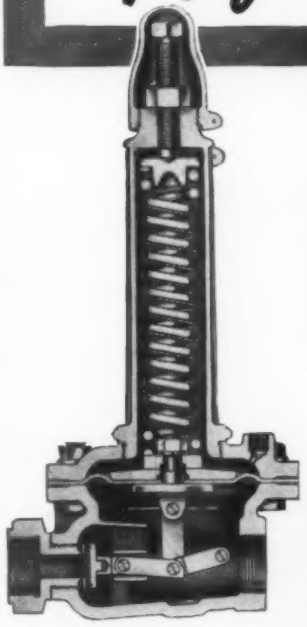
● Iroquois Gas Corporation of Buffalo, New York, has announced the election of the following officers: **Herbert D. Clay,** to executive vice president; **Howard F. Moore,** to vice president; **Herbert P. Nagel,** to assistant secretary; and **Roy W. Card,** to assistant treasurer. Other personnel changes announced were the appointments of **Richard L. Duttweiler** as sales manager and **Lyle D. Burdick** as advertising manager.

● **James H. Smith** has been appointed utilization engineer for Lone Star Gas Company's West Texas region of distribution, succeeding **H. V. Rankin.** With headquarters in Abilene, Smith will direct gas air conditioning sales activities and industrial gas installations throughout Lone Star's West Texas region.

IN THE HIGH PRESSURE FIELD

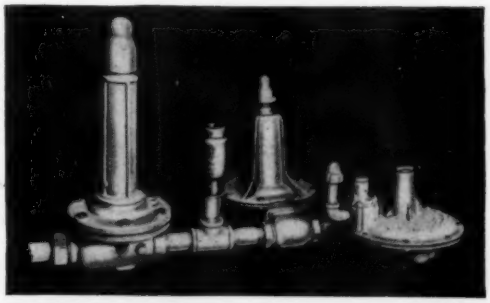
THERE IS SAFETY

IN *Reynolds...*



Accurate, Safe Control

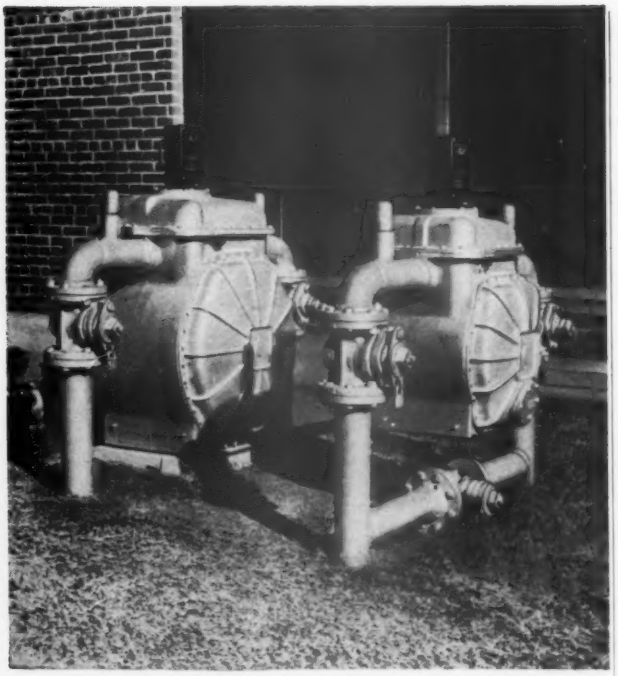
of tremendous pressures is an ever present problem in the gas field. Reynolds field Regulator illustrated at left is one of the many high pressure regulators built by Reynolds. It is thoroughly tested and proved in service. It handles up to 1,000 pounds safely reducing same to pounds. For more than fifty-five years Reynolds has designed and built gas regulators. Safety, accurate performance, years of service—these are some of the built-in factors responsible for Reynolds enviable position in the Gas Control Field.



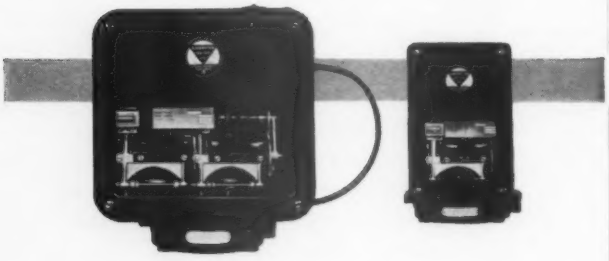
Reynolds Gas Regulator Co.

ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892



Temperature and pressure compensated metering continuously and automatically



American® BASE VOLUME INDEXES register gas quantity at standard conditions of base temperature and base pressure. BASE PRESSURE INDEXES automatically multiply volume at pipe line conditions by the pressure factor and indicate quantity at base pressure on a straight reading index.

Operation of both instruments is continuous with all functions performed mechanically through special gearing. Indicated totals are always accurate.

For full information, consult your American Meter representative.

AMERICAN®
METER COMPANY

GENERAL SALES OFFICE: Somerton, Philadelphia 16, Penna. • Albany Alhambra • Atlanta • Baltimore • Birmingham • Boston • Chicago Dallas • Denver • Erie • Houston • Kansas City • Los Angeles • Minneapolis • New York • Omaha • Pittsburgh • San Francisco • Seattle Tulsa • Wynnewood. IN CANADA: Canadian Meter Company, Ltd., Milton, Ontario • Calgary • Edmonton • Regina

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters Instruments • Reliance Regulators • Apparatus • Valves

Peak Shavings

. . . . with laughing gas

A boy and girl were out driving. They came to a quiet spot in the country lane and the car stopped.

"Out of gas," said the boy.

The girl carefully opened her purse and pulled out a bottle. "Wow," exclaimed the boy. "You've got a whole pint — what kind is it?"

"Gasoline," replied the girl.

Margo, six, was always trying to get Johnny, eight, to play domestic games with her. But he refused or made fun of her.

One day she suggested, "Let's play house."

"OK," he laughed, "I'll be the walls and get plastered."

Biggest problems for traffic planners are urban, suburban, and bourbon drivers.

No matter what happens, you can't escape someone who just knew it would.

Man may not live by bread alone, but many a crumb gets by on crust!

A lady with a young boy drove into a service station and asked that her tires be checked, but before the attendant could get to his chore, her son leaped out of the auto and said that he would check the tires. "You get back in the car and let the man do it," the woman told him. "What do you think we pay gasoline taxes for?"

Christie and Paul closed the office at noon Saturday and went to the movies. When they were seated Paul nudged Christie and gasped, "Gosh, Christie, we forgot to close the safe!"

"What's the difference?" asked Christie, "we're both here, ain't we?"

Don: "Do you know what good clean fun is?"
Lynn: "No, what good is it?"

Momma Lightning Bug said to Papa Lightning Bug: "Isn't Junior the Brightest One?"

Our Girl Shirley is like a typewriter: If you press the wrong places, you get terrible words.

While sneering at South Sea natives who beat tom-toms to ward off evil spirits, we North American natives blow horns to break up traffic jams.

A philanthropist is a man who gives his money to grateful strangers so that his family won't have to argue over it.

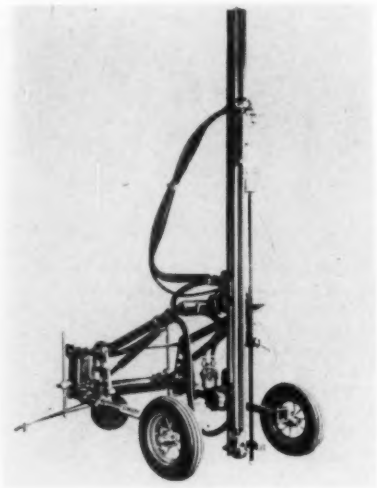
"I'm anxious to make this shot. That's my mother-in-law up on the clubhouse porch."

"Don't be a fool. You can't hit her at 200 yards."

Bootblack: "Shine your shoes, mister?"
Businessman: "No."
Bootblack: "Shine 'em so you can see your face?"
Businessman: "No."
Bootblack: "Don't blame you."

NEW EQUIPMENT
FOR THE GAS UTILITY INDUSTRY

For more information on items described here in brief, use the handy reply card and circle the corresponding numbers



Improved Wagon Drill. New improved model that uses larger, longer steels for faster drilling has been announced by Schramm, Inc. Unit features long feed travel, a new down-pressure motor and line oiler, and a full range of feed pressures. Known as the Schramm DR-126-A, the drill has many applications including drilling and blasting trenches for pipelines, water, gas and electric installations. Standard Schramm 4-in. drifter is employed with 10-ft feed travel for 8-ft steel changes. This is an improvement over the previous 8-ft travel for 6-ft steels and results in drilling time between changes being extended and delays minimized. *Schramm, Inc.*

CIRCLE (24) ON THE REPLY CARD

Compact Unit Heater. Utility Appliance Corporation has announced new 25,000 Btu unit heater (Model No. 25 UF). Unit is only 16¾ by 10⅝ in. wide, by 21-in. deep, providing maximum headroom in restricted areas. Utility engineered heat exchangers and porcelain-enameled elements guarantee maximum heating capacity and long life. Adjustable discharge louvers assure complete control of warm air flow. Automatic fan and limit controls are factory-installed and wired, with room thermostats available as accessories. Unit suspends from pipe hangers for quick and easy installation. Hinged bottom pan and lighter door on the side simplify maintenance. *Utility Appliance Corporation.*

CIRCLE (25) ON THE REPLY CARD

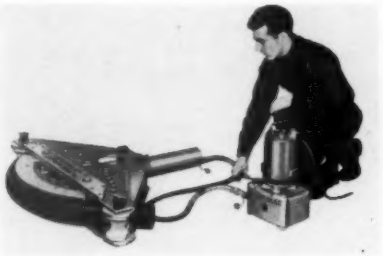
Hi-Radiant Cone Gas Burner. A new type gas burner has been developed by Hauck Manufacturing Company that provides a large radiant heat surface and high rate of heat transfer without flame impingement. This Hi-Radiant Cone Burner offers the advantages of economical operation and reduced maintenance in many heat processing applications in steel, nonferrous and ceramic furnaces, and in chemical heat reaction equipment. Burner features high speed combustion and rapid penetration of the work by radiant heat, thereby reducing furnace size and effecting economy in furnace cost and operation. *Hauck Manufacturing Company.*

CIRCLE (26) ON THE REPLY CARD

Bell and Spigot Joint Sealer. Newly perfected E-Z Poxy method for repairing leaking bell and spigot joints is now available from A & H Engineering Company. By venting the leakage and allowing a tough epoxy resin compound to harden, and firmly bond to the leaking service, a final seal can be made by plugging vent hole after the E-Z Poxy resin has hardened. Method and material are available for all joint sizes in handy packaged kit with instructions. *A & H Engineering Company.*

CIRCLE (27) ON THE REPLY CARD

Lightweight Power Bender. Greenlee has announced new lightweight hydraulic bender that will make a full 90 deg bend in 4-in. and smaller conduit and pipe with one ram stroke. One man can carry the heaviest section of the No. 884 Power Bender with ease because of high-strength aluminum alloy construction of this 40-



ton bender. Specially designed pipe supports serve as rollers when wheeling bender from one location to another. Bender is designed so that it can be used in any position without loss of operating efficiency. Quick-change, positive-locking pipe support pins assure easy, fast removal of pipe supports for quick insertion and removal of pipe from front of bender with frame always remaining in one piece. Regularly operated with No. 798AC-SA Power Pump, and connected by a quick-coupling high pressure hose, unit will bend 4-in. pipe 90 deg in 4 minutes. By using No. 797E-SA Power Pump, higher bending speed can be achieved. New bender can be used with other Greenlee attachments for bending thin-wall conduit, tubing, and bus-bar. *Greenlee Tool Company.*

CIRCLE (28) ON THE REPLY CARD

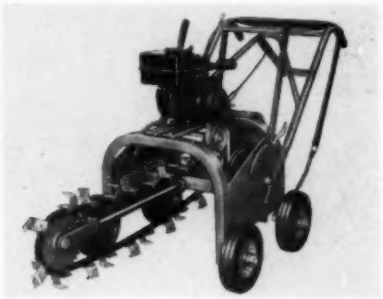
Liquid-Vaporizer Burners. Mutual Liquid Gas Equipment Company is now offering Mutual Liquid-Vaporizer Burners as completely packaged, fully automatic heating systems for operation on butane or propane. Systems are self-generating liquid vaporizer burners that utilize liquid direct from tank. No additional vaporizer is required. Units are used on boilers, dehydration kilns, or on any installation where large volumes of heat are desired. Burners are available without automatic equipment if desired. Automatic operation provides spark ignition, safety pilot, electronic flame failure protection, and control of heat input through solenoid valves. Btu capacities range from 700,000 per hour for the LVB-4 to 3,500,000 for the LVB-6. *Mutual Liquid Gas Equipment Company.*

CIRCLE (29) ON THE REPLY CARD

Two-Temperature Water Heaters. Hotstream has introduced new heater with an aluminum tank that makes two-temperature water heaters now available with a choice of tank construction. Model A-SL-DT, with stone line tank, and the new Model AL-DT "Allumatic" are adjustable as to water temperature, providing water from one outlet at up to 180 deg for home laundries and dishwashers, and water from another outlet at around 130 deg for other home uses. *Hotstream Heater Company.*

CIRCLE (30) ON THE REPLY CARD

Portable Narrow Trench Digger. Pow-R-SPADE trencher that eliminates need for hand labor in digging narrow trenches for gas underground service lines has been introduced by Stampings, Inc. Unit



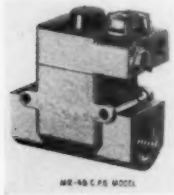
digs 3-in. trench to any depth up to 24 in. Features removable cutting blades that are self-cleaning even in wet soil and that deliver dirt on each side of trench without lumps or clods for easy back-fill. Designed for one-man operation, the trencher can be controlled, handled, and transported to and from job locations by one man. Unit is pulled backward by operator for easy control and requires no wind-up guide ropes or cables. *Stampings, Inc.*

CIRCLE (31) ON THE REPLY CARD

Triple Tamper. New triple tamper (OT11) with built-in line oiler and handle grip throttle valve is now manufactured and marketed by Le Roi Division of Westinghouse. New tamper handle grip throttle valve incorporates safety snap action which shuts-off air supply when lever is released. Safety snap shut-off action increases operator safety and reduces lost-time accidents. Plug type throttle is available as optional equipment. The 1¼-qt capacity of the non-splurging line oiler allows full 8-hr day operation with one filling. Tamper weight, 114 lb, is distributed to fully utilize power stroke of tampers, and make handling easier. Tamper lifts and carries own weight, making it only necessary to guide it while in operation. It is ideal for narrow trench, close foundation, or abutment tamping. Three tamper butts cover a 70 sq in. area compacting same amount of backfill as five single tampers. *Le Roi Division, Westinghouse*

CIRCLE (32) ON THE REPLY CARD

Safety Valve. New Gas appliance safety valve by General Controls offers a four-position head that can be ordered preset for production line ease of attaching pilot take-off and thermocouple connections. For in-the-field replacement jobs, servicemen can adjust the head easily with just a screw driver to fit existing pilot and thermocouple runs. Unit is available with or without pilot take-off, "B" valve, pilot adjustment, and independent pilot flow and is applicable for use on gas ranges, space heaters, clothes dryers, furnaces, and other gas-fired appliances. *General Controls Company.*



CIRCLE (33) ON THE REPLY CARD

Power Pack. Lincoln Electric has announced a new Power Pack attachment for their 500 amp combination a-c and d-c Idealarc welder which is designed to permit use of the welder as a power source for the Manual Lincolnweld, ML-2, semi-automatic submerged arc welder. Combination of Idealarc welder, ML-2 submerged arc welder, and Power Pack, makes manual welding possible with d-c or a-c current and submerged arc welding with d-c current. Power Pack mounts directly on Idealarc welder and is easily connected. *The Lincoln Electric Company.*

CIRCLE (34) ON THE REPLY CARD

Look for AMERICAN GAS JOURNAL Handbook Issue in September.

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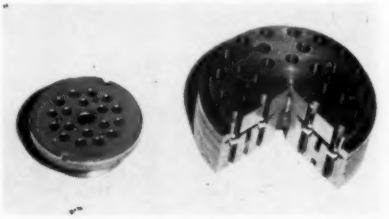
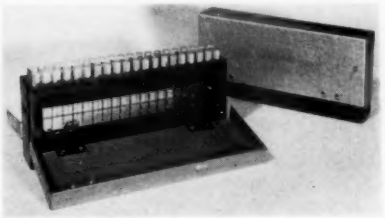
New Compressor Valve for Air and Gas. A new concept in compressor valve design has been introduced by the Ball Valve Company. Designated the BV valve, it uses the ball check valve principle instead of the plate valve technique widely



used at this time. Design uses a multitude of spring-loaded check valves built into the valve body. Advantages to the utility industry indicated by manufacturer are simplicity of design; streamline flow for greater valve efficiency; reliability in that instantaneous failures can not occur; and lower maintenance costs due to ease in reconditioning of valve and greater valve life. Valves are designed for use in compressors. *The Ball Valve Co.*

CIRCLE (35) ON THE REPLY CARD



Gaging Drill Set. Latest addition to the Griffiths' line of special tools, orifices, and conversion equipment for the gas industry, is the complete gaging drill set with new pocket-size, all steel case. Features include: Forty carbon steel drills with brass hex handles, numbered No. 41 to 80 inclusive; drill size clearly stamped on top of each drill handle for quick reference; and all steel, pocket size case designed to protect sharpness and alignment of each drill. Case can be carried in pocket or tool box. *E. F. Griffiths Company.*

CIRCLE (36) ON THE REPLY CARD

"Super-Clad" Thermocouple. Grayson Controls has developed a new thermocouple that generates greater electrical output than standard thermocouples. Interchangeable on all standard pilots, the new thermocouple was designed to eliminate service calls caused by needless pilot outages and to insure positive, trouble-free holding action. Improved thermo-electric alloys were used to gain increased voltage output. Super-clad plating protects the copper from heat and prevents oxidation for more positive operation. Unit has 24 cooling fins to create greater temperature differential and increased efficiency. *Grayson Controls Division, Robertshaw-Fulton Controls Company.*

CIRCLE (37) ON THE REPLY CARD

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does she see it in the water heater *you* sell?

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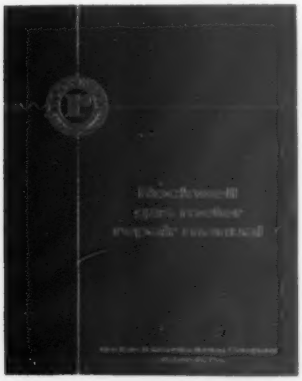
Bulletins, brochures, books of interest to gas utility industry people



Gas Meter Repair Manual. An entirely new 110-page gas meter repair manual —first complete manual of its kind issued since 1940 — provides complete, detailed instructions and illustrations covering the repair of Rockwell's entire gas meter line. In addition to specialized data, the manual can double as a "metering textbook" as it contains considerable general information on certain phases of gas metering, including a 15-page section on general meter repair and a 13-page section on proving of meters. The other three of the five-section manual cover domestic meters, large-capacity hard-case meters, and large-capacity pressed-steel meters. Extensive use of full-page exploded drawings of various meters shows clearly where each part fits in the assembled meter. Drawings are also supplemented in some cases with cutaway photos. *$2.50. Meter and Valve Division, Rockwell Manufacturing Company.*

CIRCLE (59) ON THE REPLY CARD

Gas-Venting Catalog. Dura-Vent has issued a catalog of their complete line of vent pipe and fittings for gas-burning devices. Detailed data is given on double-wall, air-insulated vent pipe in both 4-in oval and in all standard sizes of round pipe, from 3 to 12 inches in diameter, including all necessary fittings. New line of die-formed vent pipe features ease of assembly and disassembly, without tools; low outer wall temperature; and tight joints without rough, glove-tearing edges. Catalog includes chart for quick selection of vent pipe for any installation. *Dura-Vent Corporation.*

CIRCLE (60) ON THE REPLY CARD

"Quick-Way" Bulletins. Two bulletins have just been released on "Quick-Way" equipment. One is bulletin number 656 on Model 85A, truck-mounted crane-shovel, and the other bulletin is on Model 105AC crawler mounted equipment. *"Quick-Way" Truck Shovel Company.*

CIRCLE (61) ON THE REPLY CARD

"Gas Odorants for Natural and LP Gas," is the title of a new 40-page, well-illustrated technical bulletin prepared by Oronite Chemical Company to aid utility engineers with their odorizing problems. The bulletin explains the properties, types, and chemistry of various odorants; line conditioning; soil adsorption; methods of checking odorant intensities, use of odorometers; handling of odorants; and the selection and application of odorizing equipment. *Oronite Chemical Company.*

CIRCLE (62) ON THE REPLY CARD

Temperature Controls Catalog. White-Rodgers has announced distribution of a 1957 catalog that "covers the most complete line of controls ever presented to the temperature control industry by our

company." Entitled, "Automatic Controls for Heating, Air Conditioning and Refrigeration," the new fully-illustrated, three-color book includes these new controls: Fashion room thermostats, Push-Button heating-cooling thermostats, the 840's (combination hot water limit — circulator replay controls), a new line of farm controls, and new gas controls, notably a highly improved 100 percent shut-off automatic pilot. *White-Rodgers Company.*

CIRCLE (63) ON THE REPLY CARD

"Positive Flow Control." New 12-page two color catalog No. 800 covering Hills-McCanna Proportioning Pumps and Diaphragm Valves has just been released. Four basic models of precision proportioning pumps for use whenever there is a requirement for accurate and positive proportioning of flow in the range of 0-730 gph are described in detail. Construction materials, capacities, and pressures are shown for each model. Also included is a section on plastic valves and diaphragms, where plastic valves for temperatures up to 300 deg F are shown and the diaphragm material chart that provides a diaphragm selection for such diverse services as air, water, corrosive applications, slurries, liquids, and gases. *Hills-McCanna Company.*

CIRCLE (64) ON THE REPLY CARD

Street Manhole Ventilation

Flexible Hoses & Ducts. Flexaust has published an eight-page three color bulletin No. 70 covering prices and complete information on the Flexaust hose and Portovent duct products that are used for moving air, dust, fumes, and materials via pressure, suction, or gravity. *The Flexaust Company.*

CIRCLE (65) ON THE REPLY CARD

New Meter Film. Sprague Meter Company has announced availability of a new 16mm sound motion picture, "The Fundamental Principles of Dry Positive Displacement Meters." A new film is available for immediate release to all gas utility companies, schools, and all interested persons associated with the gas industry. *Sprague Meter Company.*

CIRCLE (66) ON THE REPLY CARD

Field Venting Conditions Survey. Gas appliance venting data based on widely varying but nevertheless typical operating conditions have been published in the AGA Laboratories Research Report-No. 1267, "A Field Survey of Gas Appliance Venting Conditions, Part II." Report presents a statistical analysis of draft conditions encountered in the field and supplements data previously published in Research Report No. 1243. Data presented in these companion reports is the first official industry documentation of actual venting conditions found in existing appliance installations. *AGA Laboratories.*

CIRCLE (67) ON THE REPLY CARD

Gas Mixing Problems and Applications. Cutler-Hammer has announced the release of a 74-page article by C. W. Warner, entitled, "Controlled Mixing of Gas." Warner's article contains four separate sections devoted to gas mixing fundamentals, typical gas mixing controls systems, proportional peak shaving and stand-by control, and gas jet compressor mixing control. Individual sections contain detailed descriptions and features of the systems reviewed, plus a host of supporting data including schematic flow diagrams, installation photos, performance charts, design and operating curves and information covering general gas mixing problems. *Cutler-Hammer Inc.*

CIRCLE (68) ON THE REPLY CARD

New Literature

Industrial Film Production. New Kodak booklet, "Industrial Motion Pictures," is designed to assist the industrial motion picture photographer in producing low cost films. Publication gives complete data on all 16mm Kodak motion picture films and information on problems of procedures and materials in film production. Planning, writing, shooting, editing, processing, and titling of an industrial motion picture are outlined. The 76-page booklet is an optional addition to recently revised Kodak Industrial Handbook. *Eastman Kodak Company.*

CIRCLE (69) ON THE REPLY CARD

Selas Spear Flame Burner Brochure. New Bulletin SC-1001, "Selas Series PRS Spear Flame Gas Burners," describes type of burner that produces a sharp, spear-like heating flame, widely used in brazing, soldering, jewelry manufacturing, glass blowing and working, metal manufacturing, and similar fields where a high temperature flame covering a limited area is required, using any available fuel gas and air. This free four page brochure includes sufficient data to enable customer to select proper size PRS Burner for his application. *Selas Corporation of America.*

CIRCLE (70) ON THE REPLY CARD

Water Heater Engineering Institute. An eight-page folder, describing the objectives, facilities, equipment, and curriculum of the Ruud Institute of Gas Water Heater Engineering, is available from the Ruud Manufacturing Company of Kalamazoo, Michigan. The two color booklet points out that the Institute training course is open to those working in the commercial gas water heating field as gas utility, LP-Gas company, plumbing wholesaler and retailer executives or representatives, as well as independent architects and engineers. *Ruud Manufacturing Company.*

CIRCLE (71) ON THE REPLY CARD

Gas Oven Performance. Description of design methods used to obtain uniform heat distribution and satisfactory baking in experimental domestic ovens of both the direct and indirect-fired types is now available in the AGA Laboratories Research Report, "Performance Characteristics of Gas Ovens." Effects of variation in design factors on oven performance are detailed and the importance of providing uniform gas flow through the direct-fired oven and around the indirect-fired type is demonstrated. *Report No. 1264, American Gas Association.*

CIRCLE (72) ON THE REPLY CARD

Automatic Technology Bibliography. Annotated bibliography on automatic technology has been published by the Department of Labor's Bureau of Labor Statistics. Bibliography contains 78-pages and is designed to enable research workers to use growing volume of published material on progress of automatic technology and its social and economic effects. The more than 350 references represent non-technical descriptions of operations of automated equipment in business and industry, analyses of the conditions for their use, and discussions of labor implications, management, government, and general economy. *Department of Labor's Bureau of Labor Statistics.*

CIRCLE (73) ON THE REPLY CARD

NEW SAFETY SYSTEM SEAL MEANS "FEWER SERVICE CALLS"

It indicates that the gas vent was completely designed and installed in accordance with the Metalbestos "Safety System." This new System is based on an established scientific principle governing vent design and installation procedure.

When this Metalbestos seal appears on vented gas appliance installations, utility representatives can be sure the gas vent will work.

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- **it means** fewer complaints and service calls . . . less operating overhead for the gas service department . . . more satisfied gas customers.

Look for the new "Safety System" Seal in your area. It's good for your business – good for gas.

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New Literature

"Porcelain Enamel In Industry," title of new 20-page cartoon-illustrated booklet by The Erie Ceramic Arts Company, deals briefly with origin and development of porcelain enameling, its advantages and unique features. Common uses such as meter dials, number plates, instruction plates, and special applications such as oil seal shoes, reflectance and color standards, etc. are mentioned. *The Erie Ceramic Arts Company.*

CIRCLE (74) ON THE REPLY CARD

Electromagnetic Control Catalogs. Automatic Switch Company has recently issued seven new electromagnetic control catalogs describing automatic transfer switches, remote control switches, magnetically held contactors, relays, a-c and d-c solenoids, and electric plant controls. Catalog 57-S combines information on Catalogs 57-S1 through 57-S6. *Automatic Switch Company.*

CIRCLE (75) ON THE REPLY CARD

High Pressure Gas Regulators. Newly revised eight-page bulletin (No. 1024-6) describes complete line of Rockwell high pressure regulators. Important new feature of bulletin is a page of description, photos, and drawings of the recently introduced high-pressure "141" regulator that will withstand momentary overloads as high as 1000 psi on outlet side without damage to the regulator. Complete capacity tables on "141" and "173" are included for the first time. *Rockwell Meter and Valve Division.*

CIRCLE (76) ON THE REPLY CARD

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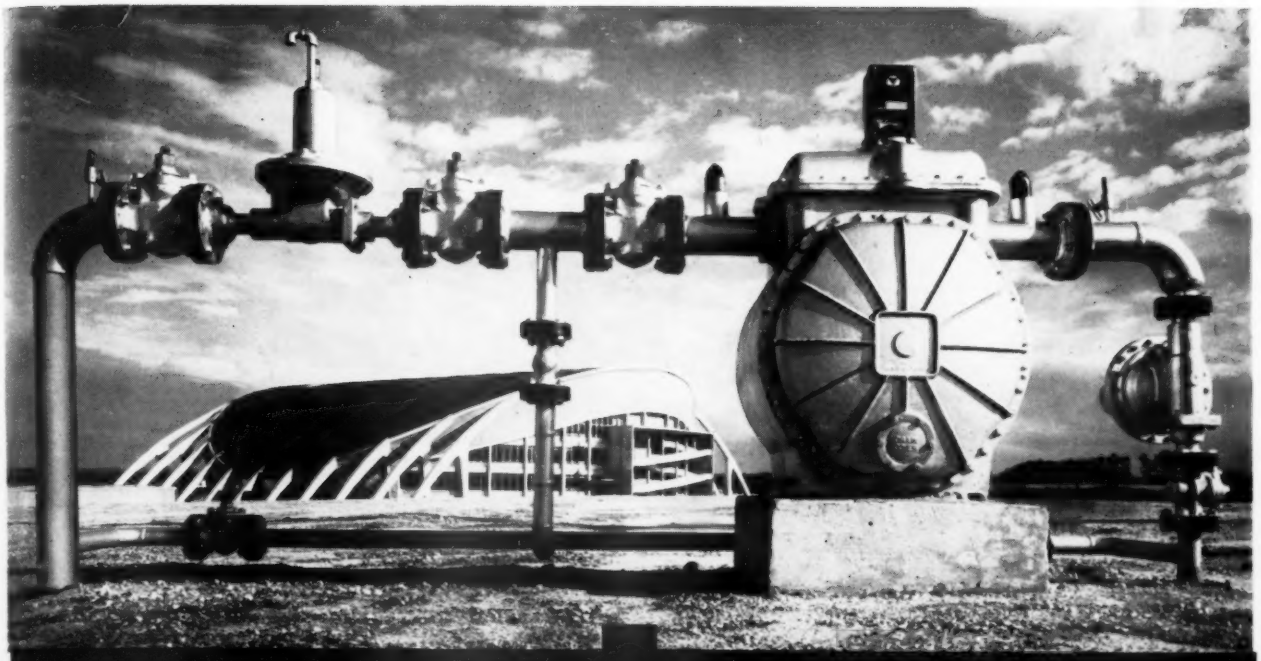

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Alabama's ultra-modern State Livestock Coliseum is one of the outstanding achievements of architects and designers anywhere—providing a pillar-free open area of 7,000,000 cubic feet which required heating. Mechanical engineers selected gas both to fuel the 7 natural gas burners which provide up to 9½ million Btu's hourly and to fuel stand-by generators.

To meter and regulate the large amount of gas required for this installation, Alabama Gas Corporation turned to American Meter Company. The installation, as shown above, is a 500B Ironcase Meter equipped with a Base Pressure Index and two type "HPC" Reliance Regulators.

This natural gas user secures complete, dependable and accurate metering and regulation with American equipment, just as users of every type of gas everywhere rely on metering, regulation and control equipment made by American . . . pioneer in the use of oil impregnated bronze bearings over 28 years ago and in many other improvements for sustained accuracy at lower cost.

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